1993

Iowa State University Bulletin, General Catalog 1993–95

Iowa State University

IOWA STATE UNIVERSITY

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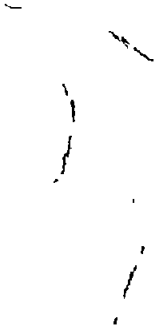

1993-95 Iowa State University Bulletin General Catalog

Iowa State University of Science and Technology
Ames, Iowa

Iowa State University Bulletin
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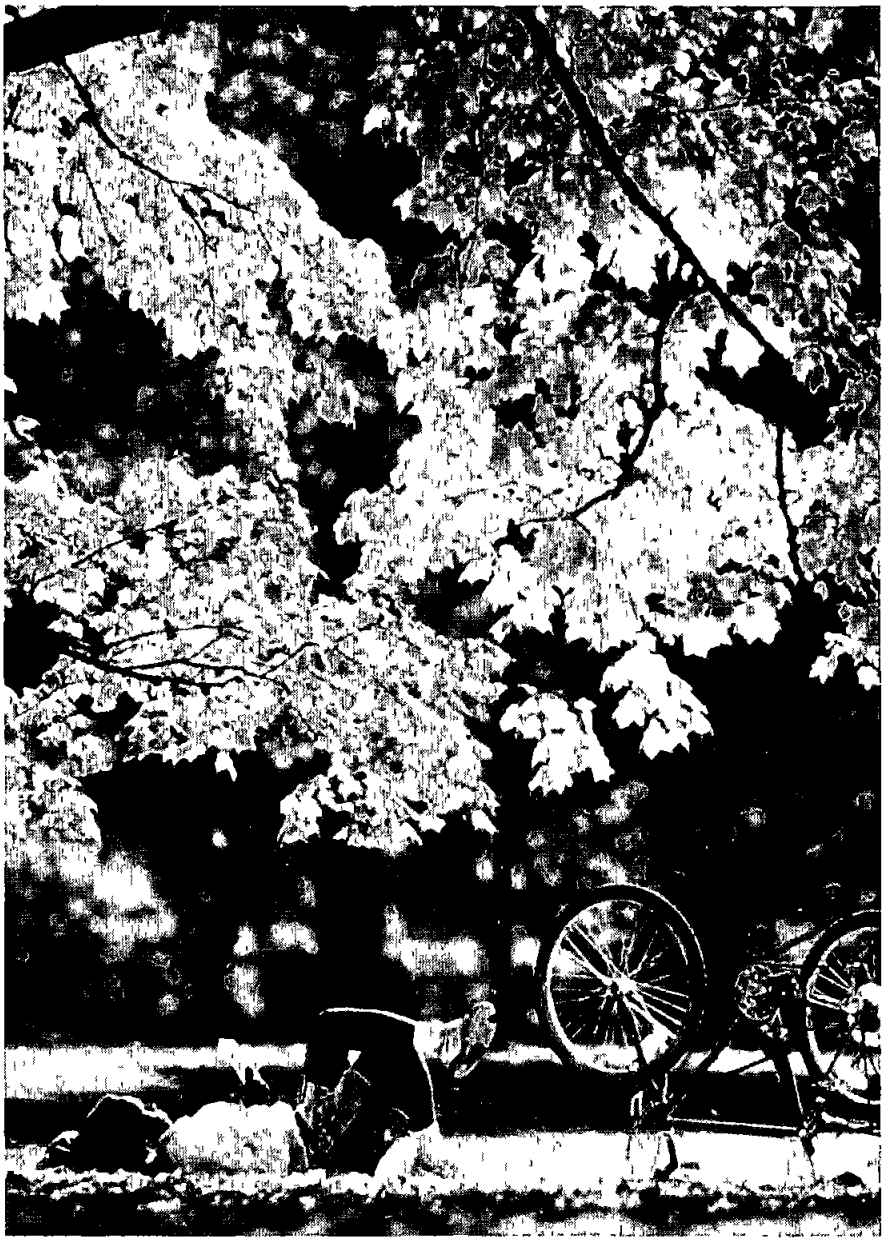
The Iowa State University Bulletin is a general catalog of information regarding fees curricula and related policies and procedures Every effort has been made to make the bulletin accurate as of the date of publication however all policies procedures fees and charges are subject to change at any time by appropriate action of the faculty the university administration or the State Board of Regents



Academic Calendar 1993-1995

Fall semester 1993

Registration	Friday August 20
Classwork begins	Monday August 23
University holidays offices closed	Monday September 6
Thanksgiving classes recessed	Friday November 19 11 p m
University holidays offices closed	Thursday & Friday November 25 & 26
Classes resume	Monday November 29 7 a m
Commencement	Saturday December 18
University holidays offices closed	Thursday & Friday December 23 & 24 and Friday December 31

Spring semester 1994

University holiday offices closed	Monday January 3
Registration	Friday January 14
University holiday offices closed	Monday January 17
Classwork begins	Tuesday January 18
Spring vacation classes recessed	Friday March 11 11 p m
Classes resume	Monday March 21 7 a m
Veishea (tentative) classes not recessed	Friday-Sunday April 22-24
Commencement	Saturday May 14
University holiday offices closed	Monday May 30

Summer session 1994

Classwork begins	Monday June 13
University holiday offices closed	Monday July 4
Commencement	Saturday August 6

Fall semester 1994

Registration	Friday August 19
Classwork begins	Monday August 22
University holiday offices closed	Monday September 5
Thanksgiving classes recessed	Friday November 18 11 p m
University holidays offices closed	Thursday & Friday November 24 & 25
Classes resume	Monday November 28 7 a m
Commencement	Saturday December 17
University holidays offices closed	Friday December 23 and Monday December 26

Spring semester 1995

University holiday offices closed	Monday January 2
Registration	Friday January 13
University holiday offices closed	Monday January 16
Classwork begins	Tuesday January 17
Spring vacation classes recessed	Friday March 10 11 p m
Classes resume	Monday March 20 7 a m
Veishea (tentative) classes not recessed	Friday-Sunday April 21-23
Commencement	Saturday May 13
University holiday offices closed	Monday May 29

Summer session 1995

Classwork begins	Monday June 12
University holiday offices closed	Tuesday July 4
Commencement	Saturday August 5

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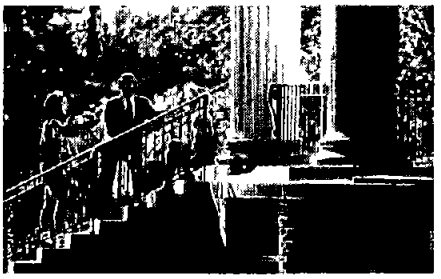

The University

Iowa State University is a broad-based university of international stature offering more than 120 majors and numerous preprofessional programs Every state and more than a hundred foreign countries are represented in the student body The academic program with an orientation around science and technology and strong programs in the humanities and the arts offers students excellent opportunities for specialization within a broad education in the liberal arts tradition

In its early years Iowa State established a national—and in many cases international—reputation in the areas of agriculture veterinary medicine home economics and engineering In recent years it has maintained its pre-eminence in these areas but has broadened and strengthened its work in other areas to the point that its largest enrollment now is in the liberal arts and sciences

The university is composed of the colleges of Agriculture Business Design Education, Engineering Family and Consumer Sciences Liberal Arts and Sciences Veterinary Medicine and the Graduate College

Iowa State is a place where students can exercise and develop all of their skills and interests The university s more than 400 student-run organizations and academic clubs offer literally thousands of leadership positions The university also boasts one of the nation s largest student-run festivals These opportunities combined with a highly regarded residence hall system have earned Iowa State national recognition as a university that works to offer students quality experiences inside and outside of the classroom

The Development of the University

Iowa State University was one of the earliest institutions established in the movement to create an educational system uniquely suited to American democratic philosophy

It was chartered by the Iowa General Assembly in 1858 Four years later the national people s college movement was underwritten by the Morrill Land Grant Act The act made federal lands available for sale to endow colleges whose aim was to promote liberal and practical education in the several pursuits and professions of life

Iowa was the first state to accept the terms of the Morrill Land-Grant Act of 1862 In March 1864 the General Assembly awarded Iowa s grant to the recently chartered institution at Ames Originally these people s colleges were primarily concerned with subjects relating to agricultural and industrial pursuits Thus this institution was chartered as the Iowa Agricultural College

The school opened its doors to a preparatory class in the fall of 1868 Instruction at the college level began the following March A class of 26 was graduated at the first commencement in 1872 Today Iowa State awards approximately 4 500 baccalaureate advanced and doctor of veterinary medicine degrees each year

Iowa State pioneered in the establishment of agricultural curricula was the first state institution to found a veterinary school and helped move engineering from a small and narrow profession to its present key position in our industrialized society Coeducational from its beginning Iowa State took leadership in domestic economy (later to become home economics)

Graduate study was offered almost as soon as classes began and the first graduate degree was conferred in 1877 Experimentation and research also started early first in agriculture and shortly thereafter in home economics engineering science and veterinary medicine

Iowa State shared the conviction with other land grant institutions that all people should have access to the ideas and knowledge of the campus By 1870 it was holding educational institutes in various Iowa towns In 1903 Iowa State set the pattern of county cooperative extension as it is conducted now throughout the United States

The expansion of the college s programs was recognized with the adoption in 1896 of the more inclusive name Iowa State College of Agriculture and Mechanic Arts

As Iowa State adapted the land-grant philosophy to the changing needs of the twentieth century its program became that of a university with special teaching responsibility in science and technology an extension education program throughout the state and extensive research interests to advance the frontiers of learning

Since 1959 it has been known as Iowa State University of Science and Technology It is a member of the Association of American Universities a prestigious organization of 53 major research universities in the United States and Canada

Accreditation, Sessions, and Enrollment

Iowa State University is accredited by the North Central Association of Colleges and Secondary Schools as well as by appropriate professional organizations

Instruction is offered throughout the year The academic year is divided into two semesters of sixteen weeks each beginning in late August and ending in mid-May

In 1992 Iowa State had an enrollment of more than 25 000 students and a faculty of more than 1 750

Nondiscrimination and Affirmative Action Policy

Iowa State University is committed to developing and implementing a program of nondiscrimination and affirmative action a responsibility the university accepts willingly because it is the right and just thing to do Because an educational institution exposes the youth of Iowa and of the nation to a multitude of ideas that strongly influence their future development there is no other area of our society where removing barriers is more critical To permit discrimination here would tend to promote misconceptions leading to future patterns of discrimination

Consistent with this belief Iowa State University herein recommits itself to comply with all federal and state laws regulations and orders including the policies of the Iowa Board of Regents which pertain to nondiscrimination and affirmative action

All administrators and personnel providing input into administrative decisions are herewith directed to ensure that all decisions relative to employment and conditions of employment will be made without regard to age color known handicaps (mental and physical) national origin race religion sex status as a Vietnam era or disabled veteran or any other classification that deprives the person of consideration as an individual Exceptions to this directive may be made in matters involving bona fide occupational qualifications business necessity actions designed to eliminate workforce underutilization and/or where this policy conflicts with federal and state laws rules regulations or orders Among the classifications that deprive the person of consideration as an individual are those based on sexual orientation or marital status

No otherwise qualified person will be denied access to or participation in any program activity, service or the use of facilities on the basis of factors previously enumerated

Reasonable accommodations will be made to facilitate the participation of persons with disabilities in all such activities consistent with applicable federal and state laws orders and policies

Further all supervisory personnel will be responsible for maintaining an environment work or otherwise that is free of racial or sexual overtones Acts by anyone that adversely affect another person s employment conditions of employment academic standing receipt of services, and/or participation in or enjoyment of any other activity will be regarded as a violation of university policy and thereby subject to appropriate disciplinary action

Iowa State University s commitment to nondiscrimination and affirmative action is of the highest priority and is to be adhered to as such It applies to all university-sponsored programs and activities as well as those that are conducted in cooperation with the university

Any person who believes that he or she has been the recipient of a discriminatory act prohibited by this policy may file a grievance with the university s Affirmative Action Office at 214 Beardshear Hall

Retaliation against persons filing complaints for the redress of a grievance or for assisting in an investigation pursuant to a filed complaint is prohibited

Administration of Iowa State University

The laws of the United States and of the State of Iowa provide for resident academic instruction research and extension education and for the management of Iowa State University of Science and Technology The university and two other state educational institutions of higher learning are governed by the State Board of Regents composed of nine members nominated by the Governor of Iowa and confirmed by the Senate of Iowa The immediate regulation and direction of the academic research and extension activities of the university are delegated by the Board of Regents to the president and faculty of the university The board appoints an executive director with overall responsibility for the administration of the central office of the board located in Des Moines

State Board of Regents

Marvin A Pomerantz President
R Wayne Richey Executive Director

Terms expire June 30, 1993

John R Fitzgibbon	Des Moines
Marvin A Pomerantz	West Des Moines
Mary C Williams	Davenport

Terms expire June 30, 1995

Marvin S Berenstein	Sioux City
Betty Jean Furgerson	Waterloo
Elizabeth D Hendricks	Cedar Rapids

Terms expire June 30, 1997

Thomas C Dorr	Marcus
Melissa L Johnson	Webb
John E Tyrrell	Manchester

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Martin C Jischke, Ph D President of the University

John J Kozak, Ph D Provost

Warren R Madden, M B A Vice President for Business and Finance Vice President for External Affairs

Thomas B Thielen, Ph D Vice President for Student Affairs

David G Topel, Ph D Dean of the College of Agriculture

David L Shrock, D B A Dean of the College of Business

Dean of the College of Design

Norene F Daly, Ed D Dean of the College of Education

David T Kao, Ph D Dean of the College of Engineering

Beverly Crabtree, Ph D Dean of the College of Family and Consumer Sciences

Dean of the College of Liberal Arts and Sciences

Dean of the College of Veterinary Medicine

Patricia B Swan, Ph D Vice Provost for Research and Advanced Studies and Dean of the Graduate College

Robert M Anderson, Jr , Ph D Vice Provost for Extension

Mary Beth Snyder, Ph D Dean of Students

Nancy L Eaton, M L S Dean of Library Services

Admissions and Records

Emeritus Dean of Admissions and Records Fred C Schlunz M S

Office of the Registrar

Registrar John V Sjoblom M A

Associate Registrars Kathleen M Jones M S W Dean Nelson M A Herman L Richtsmeier M S

Records Systems Analyst Clare Smith-Larson B A

Program Assistant Susan M Gardner M A

Coordinator of Student Records Judy Minnick B L S

Office of Admissions

Director Karsten Smedal M S

Associate Director William R Yungclas M S

Assistant Directors Phil Caffrey M S Vern E Hawkins M S Greg Millar B S Patricia J Parker B A

Admissions Counselors Kelli R Allen B S (Chicago area) Emmerson Buie B S (Chicago area) Mary R Carey B S David M Critchlow B A Thelma L Harding M S Linda Steensland M S Stace Stingley B A Linda Younger M S

Admission

When to Apply

Applicants for the fall semester should apply during the fall of the year preceding their entry to Iowa State Applications for other terms should be submitted six to nine months in advance of the desired entry date

Completed applications for admission to the professional curriculum in the College of Veterinary Medicine together with the required supporting transcripts must be received by an established deadline See *The College of Veterinary Medicine Applications* for further information

How to Apply

Applications for admission may be obtained by writing to the Office of Admissions Alumni Hall Iowa State University Ames Iowa 50011 Applicants should describe their educational backgrounds and indicate the area in which they plan to study A booklet containing the application form and detailed information concerning admission will then be sent by the Office of Admissions

Students will be notified of the action taken on their applications approximately 2 to 3 weeks after receipt of all application materials (including transcripts of coursework completed as of the time of application) Please note that admission commitments are issued for a specific semester and may be used only for the term specified

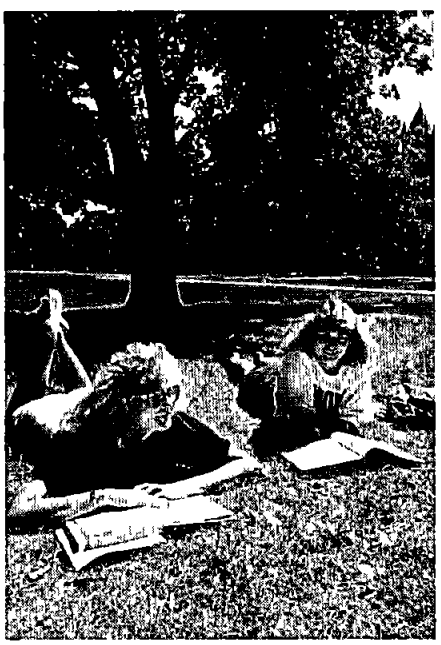
Individuals with questions concerning admission to the university may call the Office of Admissions at 515-294-5836 or toll free at 800-262-3810

Visits to the Campus

Visitors to Iowa State University are always welcome

The Office of Admissions located in Alumni Hall is open Monday through Friday from 8 a m until 5 p m Admissions counselors are available to speak with prospective students and their families about admission financial aid housing student life and academic programs and opportunities

Student-guided tours of the campus are offered each weekday at 10 a m and 2 p m Prospective students are encouraged to visit the campus and the Office of Admissions to discuss any questions they may have but personal visits are not required to gain acceptance in most instances admission can be completed by mail



Admission of Undergraduate Students Directly from High School

Students desiring admission must meet the following requirements and also any special requirements for the curriculum or college of their choice

Applicants must submit an application form for admission together with a $20 application fee ($30 for international students) and have their secondary school provide an official transcript of their academic record including credits and grades rank in class and certification of graduation

Applicants must also arrange to have their scores from either the American College Test (ACT) or the Scholastic Aptitude Test (SAT) reported to Iowa State directly from the testing agency The Test of English as a Foreign Language (TOEFL) is required of international students whose first language is not English

Applicants may be required to submit additional information or data to support their applications

a Graduates of approved Iowa high schools who have the subject-matter background required by Iowa State University and who rank in the upper half of their graduating class will be admitted unconditionally Students who do not rank in the upper half of their graduating class may be admitted to the university if they achieve the following combination of high school rank and ACT composite score (a comparable index is available for students who submit SAT scores)

High School Rank (99% is high)	ACT Composite Score
49 47%	20
46-45%	21
44-42%	22
41-39%	23
38% or below	24

Those who do not meet these requirements but who have a high school rank of 20% or above may be given the opportunity to enroll for a trial period during a preceding summer session to establish their qualifications for fall admission Those who have a high school rank below 20% (and an ACT below 24) will be denied admission

Admissions policies are established by the Faculty Senate Admission decisions are made by the admissions officers in accordance with these policies

b Nonresidents of Iowa including international students may be held to higher academic standards but must meet at least the same requirements as resident applicants

c Applicants who are graduates of nonapproved high schools will be considered for admission in a manner similar to applicants from approved high schools but additional emphasis will be given to scores obtained on standardized examinations

d Applicants who are not high school graduates but whose classes have graduated may be considered for admission They will be required to submit all academic data to the extent that it exists and achieve scores on standardized examinations which will demonstrate that they are adequately prepared for academic study

e Students with superior academic records may be admitted on an individual basis for part-time university study while enrolled in high school or during the summers prior to high school graduation

f Exceptional students may be admitted as full-time students before completing high school Early admission is provided to serve persons whose academic achievement and personal and intellectual maturity clearly suggest readiness for collegiate level study

High School Preparation Required for Admission

Graduation from an approved high school shall ordinarily precede entrance into the university

Students who wish to enter Iowa State University directly from high school (or transfer from another college or university with less than 24 semester hours of graded transferable college credit) must meet the same level of academic performance described above and show evidence of the following high school preparation

English/Language Arts
Four years emphasizing writing speaking and reading as well as an understanding and appreciation of literature

Mathematics
Three years including one year each of algebra geometry and advanced algebra

Science
Three years including one year each of courses from two of the following fields biology chemistry and physics

Social Studies
Two years including one year of U S history and one semester of U S government

Additional Entrance Requirements for the College of Liberal Arts and Sciences
In addition to the high school preparation requirements described above students applying to the College of Liberal Arts and Sciences must have completed an additional year of social studies for a total of three years plus two years of a single foreign language

Students who do not meet the high school preparation requirements mentioned here, but who are otherwise well qualified, may be admitted after individual review of their applications

Admission of Undergraduate Students by Transfer from Other Colleges

Students desiring admission must meet the following requirements and also any special requirements for the curriculum or college of their choice

Applicants must submit an application form for admission together with a $20 application fee ($30 for international students) and request that each college they have attended send an official transcript of record to the Office of Admissions Failure to provide transcripts from all colleges or universities attended may result in denial of the application or dismissal from the university If less than 24 semester hours of graded transferable college credit will be completed prior to entry at Iowa State applicants should also request that an official high school transcript be sent to the Office of Admissions

The Test of English as a Foreign Language (TOEFL) is required of international students whose first language is not English

a Transfer applicants with a minimum of 24 semester hours of graded transferable credit from regionally accredited colleges or universities who have achieved for all college work previously attempted the grade point average required by Iowa State for specific programs will be admitted A 2 00 grade point average (on a 4 00 grading scale) is the minimum transfer grade point average requirement Some programs may require a transfer grade point average higher than this minimum Higher academic standards may be required of students who are not residents of Iowa including international students

Applicants who have not maintained the grade point average required by Iowa State for specific programs or who are under academic suspension from the last college attended may after a review of their academic and test records and at the discretion of the admissions officers and the appropriate college dean be admitted conditionally or denied admission

b In addition to meeting the minimum transfer grade point average requirement described above applicants who will have completed fewer than 24 semester hours of graded transferable college credit prior to their enrollment at Iowa State must also meet the admission requirements for students entering directly from high school

c Transfer applicants under disciplinary suspension will not be considered for admission until information concerning the reason for the suspension has been received from the college assigning the suspension Applicants granted admission under these circumstances will be admitted on probation

d Transfer applicants from colleges and universities not regionally accredited will be considered for admission on an individual basis taking into account all available academic information

Transfer Credit Practices

Iowa State University endorses the *Joint Statement on Transfer and Award of Academic Credit* approved by the American Council on Education (ACE) the American Association of Collegiate Registrars and Admissions Officers (AACRAO) and the Council on Postsecondary Accreditation (COPA) The current issue of *Transfer Credit Practices of Designated Educational Institutions* published by the American Association of Collegiate Registrars and Admissions Officers (AACRAO) and publications of the Council on Postsecondary Accreditation (COPA) are examples of references used in determining transfer credit

The acceptance and use of transfer credit are subject to limitations in accordance with the educational policies of Iowa State University

a Students from regionally accredited colleges and universities Credit earned at regionally accredited colleges and universities is acceptable for transfer except that credit in courses determined by Iowa State to be of a developmental vocational or technical nature or credit in courses or programs in which the institution granting the credit is not directly involved may not be accepted, or may be accepted to a limited extent

Transfer credit from a two-year college will not reduce the minimum number of credit hours required for a baccalaureate degree if that credit is earned after the total number of credit hours accumulated by the student at all institutions attended exceeds one-half of the number of credit hours required for that degree (For purposes of this rule 65 semester or 97 quarter credit hours are considered to be one-half of the number of credit hours required for a degree)

b Students from colleges and universities which have candidate status
Credit earned at colleges and universities which have become candidates for accreditation by a regional association is acceptable for transfer in a manner similar to that from regionally accredited colleges and universities if the credit is applicable to the bachelor s degree at Iowa State

Credit earned at the junior and senior classification from an accredited two-year college which has received approval by a regional accrediting association for change to a four-year college may be accepted by Iowa State

c Students from colleges and universities not regionally accredited
When students are admitted from colleges and universities not regionally accredited they may validate portions or all of their transfer credit by satisfactory academic study in residence or by examination The amount of transfer credit and the terms of the validation process will be specified at the time of admission

In determining the acceptability of transfer credit from private colleges in Iowa which do not have regional accreditation the Regent Committee on Educational Relations upon request from such institutions evaluates the nature and standards of the academic program faculty student records library and laboratories

In determining the acceptability of transfer credit from colleges in states other than Iowa which are not regionally accredited acceptance practices indicated in the current issue of *Transfer Credit Practices of Designated Educational Institutions* will be used as a guide For institutions not listed in the publication guidance is requested from the designated reporting institution of the appropriate state

d Students from foreign colleges and universities Transfer credit from foreign educational institutions may be granted after a determination of the type of institution involved its recognition by the educational authorities of the foreign country and after an evaluation of the content level and comparability of the study to courses and programs at Iowa State Credit may be granted in specific courses or assigned to general areas of study Extensive use is made of professional journals and references which describe the educational systems and programs of individual countries

e Students with credit obtained during military service Credit will be awarded for successful completion of technical or specialized schools attended while on active duty with the armed forces to the extent that the material is applicable toward degree requirements at Iowa State Application for such credit is made at the Office of Admissions which is guided by the recommendations in the American Council on Education publication *Guide to the Evaluation of Educational Experiences in the Armed Services*

Credit will be allowed for college courses completed through the United States Armed Forces Institute (USAFI) by correspondence study and the Defense Activity for Non-Traditional Education Support (DANTES) subject to the usual rules involving credits of this nature

Admission of Special (Nondegree Undergraduate) Students

Students who wish to attend Iowa State University to take undergraduate courses but who do not plan to seek an undergraduate degree from Iowa State should apply as special students Admission requirements and academic standards regulations are the same as for regular undergraduate students Credit taken under the special student classification is applicable for undergraduate degree purposes for those who are later admitted as regular undergraduate students Credit obtained under the special student classification may not however be applied toward a graduate degree

Students enrolled in the Intensive English and Orientation Program (IEOP) are classified as special students in the College of Liberal Arts and Sciences and usually are not permitted to enroll in academic courses until they have satisfied requirements for admission as regular undergraduate students Permission to enroll in one academic course in addition to full-time intensive English study may be granted under special circumstances

Admission of Reentering Students

Reentering students are those who have previously attended Iowa State and are returning after an absence of at least one full term exclusive of the summer session The reentry application process for students who left Iowa State in good academic standing is described on page 38 under the section titled *Reentry* The reinstatement process for students who were dismissed from Iowa State for academic reasons is described on page 44 under the section titled *Reinstatement*

Reentering graduate students do not need to complete a reentry application but should notify their department and the Office of Admissions of their intent to reenter Iowa State

Residency

Classification of Residents and Nonresidents for Admission, Tuition, and Fee Purposes

These criteria are contained in the Iowa Administrative Code Board of Regents

General

A A person enrolling at one of the three state universities shall be classified as a resident or nonresident for admission fee and tuition purposes by the registrar or someone designated by the registrar The decision shall be based upon information furnished by the student and other relevant information

B In determining resident or nonresident classification the issue is essentially one of why the person is in the state of Iowa If the person is in the state primarily for educational purposes that person will be considered a nonresident For example it may be possible that an individual could qualify as a resident of Iowa for such purposes as voting or holding an Iowa driver s license and not meet the residency requirements as established by the Board of Regents for admission tuition and fee purposes

C The registrar or designated person is authorized to require written documents affidavits verifications or other evidence deemed necessary to determine why a student is in Iowa The burden of establishing that a student is in Iowa for other than educational purposes is upon the student A student may be required to file any or all of the following

1 A statement from the student describing employment and expected source of support

2 A statement from the student s employer

3 A statement from the student s parents verifying nonsupport and the fact that the student was not listed as a dependent on tax returns for the past year and will not be so listed in future years

4 Supporting statements from persons who might be familiar with the family situation

5 Iowa state income tax return

D Change of classification from nonresident to resident will not be made retroactive beyond the term in which application for resident classification is made

E A student who gives incorrect or misleading information to evade payment of nonresident fees shall be subject to serious disciplinary action and must also pay the nonresident fees for each term previously attended

F Review committee These regulations shall be administered by the registrar or someone designated by the registrar The decision of

the registrar or designated person may be appealed to a university review committee The finding of the review committee may be appealed to the State Board of Regents

Guidelines

The following guidelines are used in determining the resident classification of a student for admission tuition and fee purposes

A A financially dependent student whose parents move from Iowa after the student is enrolled remains a resident provided the student maintains continuous enrollment A financially dependent student whose parents move from Iowa during the senior year of high school will be considered a resident provided the student has not established domicile in another state

B In deciding why a person is in the state of Iowa the person s domicile will be considered A person who comes to Iowa from another state and enrolls in any institution of postsecondary education for a full program or substantially a full program shall be presumed to have come to Iowa primarily for educational reasons rather than to establish a domicile in Iowa

C A student who was a former resident of Iowa may continue to be considered a resident provided absence from the state was for a period of less than 12 months and provided domicile is re-established If the absence from the state is for a period exceeding 12 months a student may be considered a resident if evidence can be presented showing that the student has long-term ties to Iowa and re-establishes an Iowa domicile

A person or the dependent of a person whose domicile is permanently established in Iowa who has been classified as a resident for admission tuition and fee purposes may continue to be classified as a resident so long as domicile is maintained even though circumstances may require extended absence of the person from the state It is required that a person who claims Iowa domicile while living in another state or country will provide proof of the continual domicile as evidence that the person

1 Has not acquired domicile in another state,

2 Has maintained a continuous voting record in Iowa and

3 Has filed regular Iowa resident income tax returns during absence from the state

D A student who moves to Iowa may be eligible for resident classification at the next registration following 12 consecutive months in the state provided the student is not enrolled as more than a half-time student (6 credits for an undergraduate or professional student 5 credits for a graduate student) in any academic year term is not enrolled for more than 4 credits in a summer term for any classification, and provides sufficient evidence of the establishment of an Iowa domicile

E A student who has been a continuous student and whose parents move to Iowa may become a resident at the beginning of the next term provided the student is dependent upon the parents for a majority of financial assistance

F A person who is moved into the state as the result of military or civil orders from the government for other than educational purposes or the dependent of such a person is entitled to resident status However if the arrival of the person under orders is subsequent to the beginning of the term in which the student is first enrolled nonresident fees will be charged in all cases until the beginning of the next term in which the student is enrolled Legislation effective July 1 1977 requires that military personnel who claim residency in Iowa (home of record) will be required to file Iowa resident income tax returns

G A person who has been certified as a refugee or granted asylum by the appropriate agency of the United States who enrolls as a student at a university governed by the Iowa State Board of Regents may be accorded immediate resident status for admission tuition and fee purposes where the person

1 Comes directly to the state of Iowa from a refugee facility or port of debarkation or

2 Comes to the state of Iowa within a reasonable time and has not established domicile in another state

Any refugee or individual granted asylum not meeting these standards will be presumed to be a nonresident for admission tuition and fee purposes and thus subject to the usual method of proof of establishment of Iowa residency

H An alien who has immigrant status establishes Iowa residency in the same manner as a United States citizen

Facts

A The following circumstances although not necessarily conclusive have probative value in support of a claim for resident classification

1 Reside in Iowa for 12 consecutive months and be primarily engaged in activities other than those of a full-time student immediately prior to the beginning of the term for which resident classification is sought

2 Reliance upon Iowa resources for financial support

3 Domicile in Iowa of persons legally responsible for the student

4 Former domicile in the state and maintenance of significant connections therein while absent

5 Acceptance of an offer of permanent employment in Iowa

6 Other facts indicating the student s domicile will be considered by the universities in classifying the student

B The following circumstances standing alone do not constitute sufficient evidence of domicile to effect classification of a student as a resident under these regulations

1 Voting or registration for voting

2 Employment in any position normally filled by a student

3 The lease of living quarters

4 Admission to a licensed practicing profession in Iowa

5 Automobile registration

6 Public records for example birth and marriage records Iowa driver s license

7 Continuous presence in Iowa during periods when not enrolled in school

8 Ownership of property in Iowa or the payment of Iowa taxes

Orientation

The purpose of orientation is to help new students make a smooth transition to Iowa State University At orientation students plan their academic program take tests to ensure placement in appropriate courses register for classes learn about university policies and procedures and prepare for their personal and social adjustment to the university The University Orientation Committee composed of Iowa State University students faculty and staff is responsible for the orientation programs the undergraduate colleges of the university in cooperation with the Office of Orientation and Retention Programs have responsibility for the implementation of orientation programs for new students and their families

The Orientation Committee conducts an extensive orientation program during the summer with additional programs held prior to each term Special orientation sessions are conducted for transfer students during the spring New students receive a written invitation to attend an orientation program before their first semester at the university Parents or spouses are encouraged to accompany students

Summer Orientation

The summer orientation program consists of one-and a-half day sessions scheduled in June Each spring new students and their parents or spouses are asked to select a convenient time from among a number of orientation sessions that are scheduled during June In addition to preparing their class schedules for fall semester new students with their parents or spouses participate in guided tours of the university attend informational meetings about policies and procedures at the university and meet formally and informally with faculty staff and other new students and their families These meetings create a comfortable informative atmosphere lessen existing anxieties assist each person in the development of a clearer *understanding of the challenge of the* university environment and make it possible for new students—with support from their parents or spouses—to begin to make the academic and social decisions that are faced by all students at the university

Cyclone Aides Iowa State undergraduate students with widely varying backgrounds and interests help acquaint new students and their families with the university during orientation programs

Housing and meals are provided in campus residence halls at a nominal cost Cyclone Aides live in the residence halls with the new students and are available at all times for informal discussion

WelcomeFest

WelcomeFest activities are scheduled during the first week of fall semester to welcome new students and to acquaint them with the university All new students including transfer students are invited to participate in WelcomeFest

Cyclone Aides are available to help new students with questions and concerns at the beginning of fall semester and at WelcomeFest

Registration

In order to register for classes a student must first be admitted to the university Registration and the payment of assessed fees are required of all who attend classes Enrollment is not complete until fees are paid including board and room fees for those living in residence halls

Students who wish to initiate registration within the period between the fifth and tenth class days must obtain written permission from the instructors under whom they will be taking work and the approval of the dean of the college in which they will be registered Registration for any semester will be closed after the tenth class day

For summer session the fifth and tenth class days would be replaced by the third and fifth class days Details on the registration process and registration policies and regulations are provided on page 34 in the section titled *Registration*

Credit by Examination (CBE)

It is ISU policy to grant academic credit by examination in many of the undergraduate courses listed in the university catalog Credit is awarded primarily in the introductory level classes in mathematics natural physical and social sciences and the liberal arts Students with superior high school backgrounds or those with college level proficiency in certain subject areas are strongly encouraged to investigate and attempt testing in the CBE programs available

Types of CBE Programs

Students may earn academic credit in any of four ways and have that credit recorded on their academic record when they enroll Programs accepted at ISU include the Advanced Placement (AP) Program the International Baccalaureate (IB) Examinations departmental examinations and the College Level Examination Program (CLEP)

Advanced Placement (AP) Program of the College Board

This program allows students while still in high school to take examinations for credit at the college level Iowa State awards credit or advanced placement through the Advanced Placement Program in art and design biology chemistry computer science economics English foreign languages government and politics history mathematics music and physics High school counselors and teachers will assist with testing arrangements

Generally students scoring 3 or better on the exams will be considered for course credit based on departmental review of the exams In some departments only scores of 4 or better will be considered for credit

Correspondence concerning the Advanced Placement Program should be addressed to the College Board Advanced Placement Examinations P O Box 977-IS Princeton New Jersey 08541

International Baccalaureate Examinations

The International Baccalaureate Program offered at many high schools in the United States and abroad allows students the opportunity to take examinations for credit at the college level These examinations are offered at subsidiary and higher levels

Iowa State awards credit for higher level examinations only in the following subject areas art and design biology chemistry economics English foreign languages geography history mathematics organization studies philosophy physics psychology and social anthropology Students must receive a minimum score of 4 to qualify for academic credit in most subject areas Some departments however require a minimum score of 5

Correspondence concerning the International Baccalaureate Program should be addressed to International Baccalaureate North America 200 Madison Avenue Suite 2303 New York New York 10016-3903

Departmental Examinations

Students may take locally constructed departmental examinations for undergraduate credit in specified subject areas for which they and the department feel they have the necessary preparation These exams are generally administered by the department which offers the course (for exceptions see CLEP offerings below) Students interested in taking departmental (or CLEP) examinations should contact the appropriate department for specific information on the course covered by the exam and the exam itself A **nonrefundable** fee is charged for each departmental examination requested If the exam is passed a grade of T will be reported to the Registrar s Office The T grade represents performance equivalent to a C or better in the course T grades are not used in computing students grade point averages however the credit does become part of their official academic record and may be applied toward their graduation requirements

A list of the most frequently requested exams and the date(s) and time(s) they are administered each semester is published in each semester s *Schedule of Classes* Most examinations for credit are prepared by the department offering the course In some cases the examination used is part of the College Level Examination Program (CLEP) where the content of the CLEP test has been judged to be an equivalent to the content of the course

College Level Examination Program

Iowa State will award up to six semester credit hours in each of three general CLEP tests (Social Sciences and History Humanities and Natural Sciences) **if** the test score places the student at or above the 60th percentile on national norms ISU does not accept the general CLEP tests in either mathematics or English

Subject CLEP tests accepted at ISU include American Government (Pol S 215) Introductory Accounting (Acct 284 and 285) Introductory Biology (Biol 109 nonbiology majors only) Introductory Psychology (Psych 101) Introductory Sociology (Soc 134) Trigonometry (Math 141) and Elementary Calculus with Functions (Math 165) Students must score at or above the 50th percentile on national norms to qualify for credit

A **nonrefundable** fee is charged for each CLEP test requested and all requests must be made two weeks prior to the test date in order to guarantee that a test booklet is available CLEP tests are offered at the beginning of each semester and during Summer Orientation (for entering students) For information on whether to take any of the CLEP tests, contact the department that offers the course To obtain a registration card or to get detailed information on any of the tests contact the Student Counseling Service Testing Office 373 Student Service Building Iowa State University Ames Iowa 50011

Policies and Procedures Governing CBE Tests

1 Departmental and CLEP tests are offered primarily to students currently enrolled at ISU Former and future students will receive credit only if they enroll within one academic year after the date of the test

2 Permission to take a departmental examination is obtained from the department Students may be denied permission because (a) the nature of the course is such that proficiency cannot be measured by such a test, (b) the student does not appear to have adequate background to pass the examination for the course or (c) the student would not otherwise be allowed to enroll in the course Students may appeal such a denial to the dean of the college in which the department is administered and subsequently to the provost

3 Students may ordinarily attempt a CBE test only once in any course or area Under special circumstances a re-test may be taken upon approval of the department in which the course is offered

4 Departmental examinations and CLEP subject tests cover only a single course and students may not test out of independent study or special topic courses

5 There is a **nonrefundable fee** for all departmental and CLEP tests The fee is set by the Board of Regents and is subject to change

6 Examinations are usually given just prior to or within two weeks of the beginning of fall and spring semesters CLEP tests are also offered to incoming students during Summer Orientation in June For more information students should check the *Schedule of Classes* or contact the department that offers the class

7 Credit for the CLEP general examinations is not evaluated as equivalent to any specific course and cannot be used in place of specific course requirements for the major All colleges (except Engineering which does not accept these tests) allow CLEP general credits to be used for either general requirements or elective credit Students are responsible for checking with their academic advisers to determine whether such credit is to their benefit

8 Iowa State will evaluate at the time of admission Advanced Placement (AP) College Level Examination Program (CLEP) and International Baccalaureate (IB) test results taken at other approved centers An agreement exists among the public colleges and universities in Iowa which allows credit earned through CLEP examinations to be directly transferred to Iowa State Credit for other college and university CBE programs will be evaluated and accepted if (a) it meets other criteria established at ISU and (b) it is accompanied by at least 12 semester credit hours earned at the institution making the report

9 Credit earned from CBE will be posted to the student s academic record at the end of the term However CBE credits will be counted toward the projected year in school classification used to establish registration start dates

10 Some professional programs do not accept T credit in preprofessional courses Students who anticipate applying to such programs should inquire about the acceptability of such credit before registering for such CBE tests

11 Credit established at Iowa State will usually transfer to other colleges and universities however the final decision rests with the institution reviewing the transcript

Fees and Expenses

(Fees and tuition are subject to change without notice)

A registration fee is charged to all students of the university A full registration fee covers most laboratory fees use of the library membership in the Memorial Union and a number of student activities In certain courses involving special expenses an additional fee may be charged These fees are indicated in the course description of the specific courses involved

Students who are not residents of Iowa pay an additional tuition fee each semester This tuition fee is assessed in accordance with regulations of the State Board of Regents which are found in this catalog under *Admissions and Records*

All fees and expenses listed in this catalog are effective as of summer session 1993 They are subject to change without notice

Fee Schedule

	Resident	Nonresident
Per Semester		
Undergraduate (12 or more hours)	$1096	$3613
Graduate (9 or more hours)	1302	3767
Graduate M B A (9 or more hours)	1575	4041
Veterinary Medicine (12 or more hours)	2500	6700

Fees for students enrolled for less than a full course load are given below There is a minimum 2-hour fee for all students Audits and zero credit courses are assessed on contact hours and there is a maximum charge for zero credit courses of 3 credit hours R credits are assessed for the minimum fee only if no other credits are taken The continuous registration fee for graduate students is $70 If the total number of credits includes 5 credit such as 6 5 fees are assessed on the next larger whole number of credits Therefore 6 5 credit hours would be assessed as 7 credit hours

Summer session fees are charged per credit hour as indicated in the hourly fee schedule

Hourly Fee Schedule

No of Hours	Undergraduate Res	Undergraduate Nonres	Graduate Res	Graduate Nonres	Vet Res	Med Nonres
1	$184	$184*	$290	$290*	$418	418*
2	184	184*	290	290*	418	418*
3	276	276*	435	435*	627	627*
4	368	368*	580	580*	836	836*
5	460	1 510	725	2 095	1 045	2 795
6	552	1 812	870	2 514	1 254	3 354
7	644	2 114	1 015	2 933	1 463	3 913
8	736	2 416	1 160	3 352	1 672	4 472
9	828	2 718	1 302	3 767	1 881	5 031
10	920	3 020			2 090	5 590
11	1 012	3 322			2 299	6 149
12 or more	1 096	3 613			2 500	6 700

*Nonresident students taking 4 hours or fewer are assessed at the resident rate

Private Music Instruction

University students, per semester	
1 credit	$ 78
2 to 3 credits	112
Nonuniversity students, per semester	
1 lesson per week ½ hour	$145
1 lesson per week 1 hour	$224

Special Students and Noncollegiate Students

Special students and noncollegiate students pay the same fees as undergraduates

Application Fee

A fee of $20 must accompany the application for admission and is nonrefundable The application fee for international students is $30 This fee does not apply to special students or workshop applicants

Payment of Fees

Students will be billed by the Accounts Receivable Office for tuition room and board and various other university charges A statement of charges will be mailed on the first of each month to students at their in-session or interim address It is the student s responsibility to ensure the Registrar s Office has a correct mailing address Students who do not receive a billing statement before the term begins should go to the Receivables Office to obtain the amount of their account balance due Failure to receive a billing statement will not exempt students from late penalties or from having a hold placed on their registration

Deferred Payment

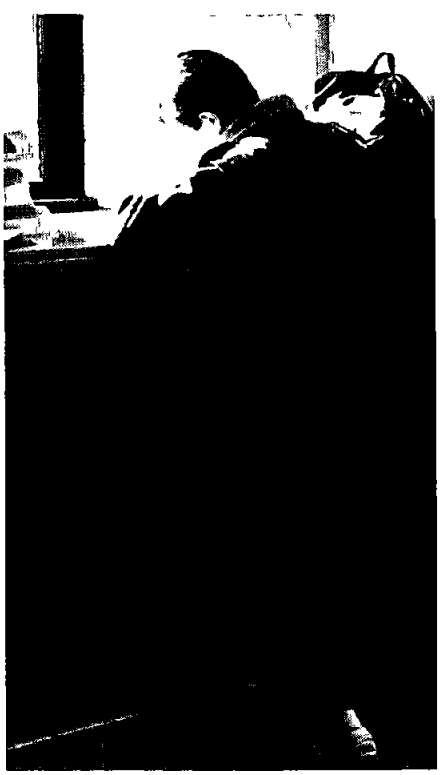
Most university fees are payable in three installments for fall and spring semesters Payments for fall semester will be due September 15 October 15 and November 15 Payments for spring semester will be due February 15 March 15 and April 15 Students will be charged a $10 administrative fee if they elect to use the deferred option Students who do not pay their first payment in full by the due date will automatically select the deferred option

Past Due Accounts

Students having past due accounts receivable charges prior to the beginning of classes will be dropped from enrollment if these past due accounts are not paid before the first day of classes

Late Registration Fee

Students who do not complete their registration before the first day of classes are charged a late registration fee of $20



Late Fee Payment
If payment of the minimum due is not made by the deadline printed on the billing statement all fees become due immediately A one percent finance charge will be assessed on the total amount due at that time These students will also have a hold placed on their registration until payment of the total amount due has been made

Reinstatement Fee
With written permission of the college students who have had their registration canceled for nonpayment of fees may be reinstated A reinstatement fee of $20 will be assessed

Activity Fee
The activity fee for undergraduates and graduate students taking courses on campus is included in the general registration fee Fees for courses taken off campus do not include the activity fee Off-campus students may pay $38 per semester which allows them to pay student admission rates to concerts lectures debates and athletic events

Senior Fee
A $2 fee covers the cost of special senior activities

Graduation Fee
Undergraduate and graduate students are charged a $15 graduation fee the term they receive their degree

Transcript Fee
Students may obtain an official transcript of their student academic record for $3 Additional copies ordered and processed at the same time are $2 each An additional $2 service charge for each transcript is assessed if same day service is requested

Withdrawal Registration and Refund Schedule
To cancel their registration students must notify the Registrar s Office before the first day of classes to avoid tuition assessment Beginning the first day of classes it will be necessary for students to formally withdraw from the university to terminate their registration Tuition adjustments are made for withdrawals of registration according to the following schedule

	Student Pays
First week of classes	10%
Second week of classes	25%
Third week of classes	50%
Fourth week of classes	75%
After fourth week	100%

Fee refund for students who drop into light classification
100 percent if change is made during first week
75 percent if change is made during second week
50 percent if change is made during third week
25 percent if change is made during fourth week
No refund after the fourth week

Refund schedule for first time enrolled recipients of Title IV financial aid will be calculated in accordance with PL 102-325 the Higher Education Amendments of 1992

For the refund policy for off-campus courses contact ISU Continuing Education

Workshop Refunds
Students who drop workshops of one week or less before the first class meeting will receive a full (100 percent) refund for the workshop Once the workshop begins there will be no refund Students who drop two-week workshops will receive a 100 percent refund if they drop before the first class meeting a 90 percent refund if they drop on the first day of class, and no refund after the first day of class Students who drop a three-week workshop will receive a 100 percent refund if they drop before the first class meeting a 90 percent refund if they drop on the first or second class day and no refund after the second day of classes

Change of Schedule Fee
Starting the sixth day of classes a $5 fee is charged for course drops additions and section changes Changes approved by the classification office at the same time are charged a single fee

Workshops
Undergraduate students enrolled in 1- 2- or 3- credit workshops pay $92 per credit hour tuition graduate students pay $145 per credit hour tuition

Off-Campus Fees
Undergraduate students pay $92 per credit with a maximum charge of $1 096 graduate students pay $145 per credit with a maximum of $1 302

Developmental Mathematics Fee
Students enrolled in Math 10 or Math 20 will be charged $184 This is a separate fee which is charged in addition to other fees and tuition Students will be charged the developmental math fee each term they are enrolled in Math 10 or Math 20

Summer Camp Fee
A special tuition rate is assessed to students participating in summer camp programs The undergraduate assessment is $368 and the graduate rate is $580 Summer camp programs entitled to the special rate are Anthropology Forestry and Geology Students will be charged other fees in addition to tuition for enrolling in these programs To obtain total fee information students should contact the director of the individual program

Matriculation Fee
A fee of $28 is charged all new degree-seeking students the first term they register This fee is charged to all new students except special students veterinary medicine students graduate students winter agricultural studies students and off-campus students

Sponsored International Student Fee
Agencies and foreign governments which require special administrative and fiscal reporting services of ISU will be assessed an administration fee The fee for 1993-95 will be 3 percent of the total tuition charge billed the sponsor On succeeding years the fee may be raised after 90 days advance notice to the sponsoring agency

Computer Fee
All students are charged a computer fee each semester Undergraduate and graduate students enrolled in the College of Engineering (including biomedical engineering) or the Department of Computer Sciences are charged $100 per semester All other students are charged the standard computer fee of $40

Students enrolled less than full-time are assessed prorated computer fees according to the number of credits for which they are enrolled Students enrolled for 3 credits or less are assessed the minimum computer fee which is $30 for students enrolled in engineering or computer science and $10 for all other students

Graduate students holding research or teaching assistant appointments are charged $50 for those in engineering or computer science and $20 for all other majors regardless of the number of credits and regardless of the fraction of time they are on appointment

Students enrolled only in courses of the following types are not assessed a computer fee workshops co-op programs or internships off-campus courses Iowa State students on exchange programs abroad the Intensive English and Orientation Program Lakeside Laboratory courses camps agriculture travel program practicum or student teaching experiences General Graduate Studies 600 or as required registration status for graduation High school students enrolled under the Post-Secondary Enrollment Act are not assessed a computer fee

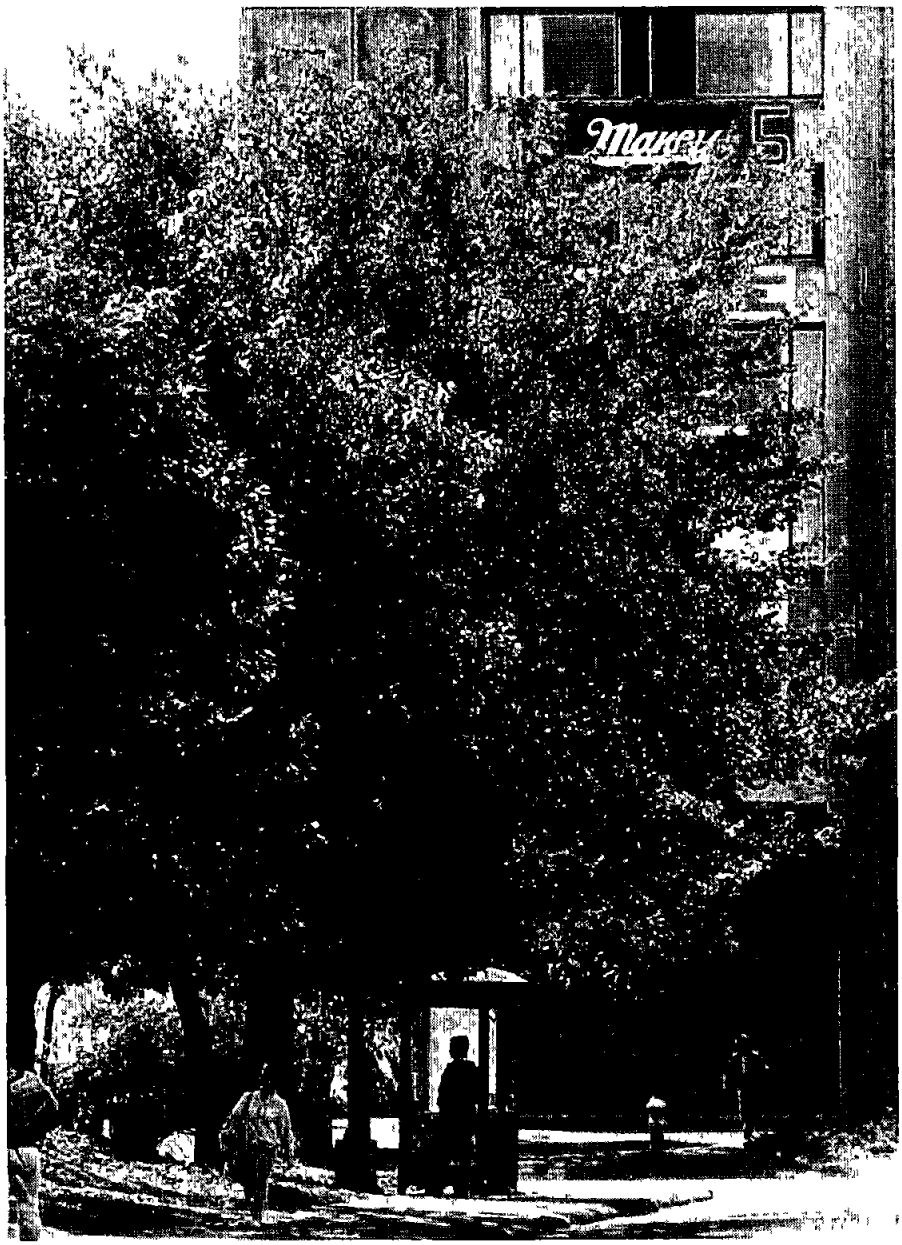
The refund schedule for the computer fee for withdrawal or for reduction from a full load to light classification is 100 percent during the first week 75 percent during the second week 50 percent during the third week and 25 percent during the fourth week with no refunds after the fourth week

Students who transfer into engineering or computer science at any time during the semester will be assessed the additional computer fee amount The refund schedule for students transferring to a lower computer fee category will be 100 percent of the difference between the old and the new computer fee rate during the first week 75 percent during the second week 50 percent during the third week and 25 percent during the fourth week with no refund after the fourth week

Student Health Fee

A $40 student health fee which partially finances the services of the Student Health Center is charged to all students This fee is not assessed to students enrolled for four credits or less undergraduate co-op students students enrolled in off-campus courses only, Iowa State students on exchange programs abroad graduate students enrolled in General Graduate Studies 600 and graduate students enrolled as continuous registration (These exemptions do not apply to international students or to graduate students on C- base) Students who are exempt from the health fee may participate in the Health Plus Plan as described under *Optional Fees*

Students who withdraw or change to an exempt status as defined above will receive a credit adjustment of 100 percent during the first three weeks with no credit adjustment after the third week Students who add courses at any time during the semester will be assessed the student health fee if applicable according to the guidelines stated above



Student Financial Aid

Director Earl E Dowling

Associate Director, Technical Operations Richard Lephart

Assistant Director, Scholarships Charles Turner

Assistant Director, Special Populations Deborah Burdick

Assistant Director, Student Employment Janie Barnett

Assistant Director, Student Loans Roberta Johnson

Assistant Director, Student Services Delores Hawkins

Advisers Juan Davila Ted Maakestad Julie Poorman Lynette Reed

The Office of Student Financial Aid offers assistance with financial concerns Grants scholarships loans and part-time employment opportunities are available in various combinations to meet the difference between the amount the student and his or her parents can reasonably be expected to provide and the cost of attending the university Academic recognition scholarship programs are administered through this office Recipients are selected on the basis of academic accomplishments other demonstrated talent or financial need

All state and federal aid programs are subject to review by their respective governing agencies and may be changed without notice

Eligibility for need-based financial aid is determined by the Free Application for Federal Student Aid (FAFSA) provided by American College Testing (ACT) College Scholarship Service (CSS) and Pennsylvania Higher Education Assistance Agency (PHEAA) Students should submit the FAFSA by mid-February prior to the fall term of enrollment in order to receive priority consideration A new application must be completed each academic year Applications must be **received** no later than March 1 Applications received after March 1 will be given secondary consideration and awarded as funds are available New students enrolling spring semester or summer session should complete the current year s aid application to apply for any available financial aid To be eligible for financial aid a student must be a U S citizen or permanent resident enrolled on at least a half-time basis and making satisfactory academic progress toward a degree If signed copies of the student s and parents income tax returns are requested they should be sent directly to the Office of Student Financial Aid 12 Beardshear Hall

Students may use their financial aid for study in other countries if they have clearance for the transfer of credit to their degree programs and have made financial aid arrangements prior to departure For further information contact the Office of International Students and Scholars E O Building or Student Financial Aid 12 Beardshear Hall

The FAFSA as well as other financial aid information and sample budgets are available from the Office of Student Financial Aid Room 12 Beardshear Hall High school counselors also have the forms

Financial aid programs generally consist of three types gift aid (scholarships and grants) loans and part-time employment Laws regulations and policies governing these programs are subject to change

I. Gift Aid

A Scholarships

1 ISU Scholarship/Grants These awards are based on financial need as determined by the FAFSA A student must complete the FAFSA to be considered Many of these awards are based on academic talent in addition to financial need

2 Entering freshmen can obtain a copy of *Scholarships for Entering Freshmen* containing information about scholarships available to entering freshmen at Iowa State by writing to Iowa State University Office of Admissions Alumni Hall, Ames Iowa 50011

3 College and Departmental Scholarships Students are encouraged to contact the scholarship chair in their department or college Scholarships based on academic merit and/or financial need are available in most areas of study but you may need to complete a separate application to be considered

4 Iowa Grant Iowa residents demonstrating financial need may be eligible for a $1 000 Iowa Grant Students must complete the FAFSA to be considered

5 Iowa Minority Grant for Economic Success (IMAGES) Iowa minority students may qualify for this state-supported grant Eligibility is based on demonstrated financial need as determined by the FAFSA with priority given to entering first year students who have participated in a College Bound activity The maximum grant is $3 500

6 Other Scholarship Sources Students are encouraged to pursue funds from agencies and private organizations on campus and in their hometowns

B Grants

1 Federal Pell Grant The maximum annual award under this program is $2 300 All undergraduate applicants for financial aid must apply for the Federal Pell Grant by completing the FAFSA These forms are available from high school counselors and the Office of Student Financial Aid

2 Federal Supplemental Educational Opportunity Grant An eligible undergraduate student may be awarded a grant of $100 to $4 000 on the basis of financial need A student must complete the FAFSA in order to be considered

3 Less Than Half-Time Student Grant The purpose of this grant is to provide partial financial support to undergraduate students spouses of currently enrolled students and returning students who plan to enroll at Iowa State University for less than 6 credits *Applications can* be obtained from the Office of Student Financial Aid in 12 Beardshear Hall

4 Officer Education (ROTC) Financial Assistance Grants *All students enrolled* in Advanced ROTC (third and fourth years) in the Army Navy and Air Force programs are provided an allowance of $100 per month for up to 10 months per year The Navy program also includes a 4-year program which provides $100 per month for up to 10 months per year For further information contact the appropriate ROTC department in 132 Armory

5 Tuition Assistance Grant for Undergraduate Foreign Students Undergraduate foreign students who are faced with financial hardship resulting from unforeseen circumstances may apply for this grant The maximum award is $700 per academic year Apply to the Office of International Students and Scholars E O Building

6 International Student Financial Aid International students may contribute a small voluntary fee to this fund These funds will be used to assist international students who have unforeseen financial emergencies For further information contact the Office of International Students and Scholars

II Loans

A Federal Perkins Loan An eligible undergraduate student may borrow up to $3 000 per year depending on financial need and the availability of funds A maximum of *$15 000 for total undergraduate study* is allowed A maximum total of $30 000 may be borrowed for undergraduate and graduate programs combined Interest of 5 percent on the unpaid balance begins with repayment of *the loan principal 9 months after ceasing at* least half-time enrollment A student must complete the FAFSA in order to be considered

B University Long-Term Loans (ULTL) Private donors contribute the funds for these loans which are awarded on the basis of need to undergraduate and graduate students The interest rate of 5 percent begins with repayment of principal 6 months after ceasing at least half-time enrollment Deferment provisions are available in some instances A student must complete the FAFSA in order to be considered

C Federal Health Professions Loans and Scholarships These programs are limited to those students accepted for enrollment in the College of Veterinary Medicine The loan funds have a 5 percent interest rate Deferment and cancellation provisions are available in some instances The FAFSA is required and parental information must be provided regardless of age or dependency of the student

D University Emergency Loans The Emergency Loan Program is intended to meet students unplanned and unexpected education-related expenses (These loans are not available to students who are enrolled **only** in off-campus courses) Applicants must demonstrate that they have a verifiable means by which to repay their loans by the due date Interest on emergency loans will begin on the date the loan is processed in the Treasurer s Office and is computed at the *simple monthly* rate of 75 percent of the unpaid balance (an annual percentage rate of 9 percent)

Emergency loan applications can be obtained *at the Office of Student Financial Aid Room* 12 Beardshear Hall Students should allow 48 hours for processing the emergency loan application

E Federal Stafford Loan *There are two* types of Stafford loans available to students—the subsidized loan and the unsubsidized loan Both are low-interest loans made by a lender such as a bank credit union or savings and loan association to help pay for education after high school Both loans are insured by the federal government and the guarantee agency in your state Subsidized Stafford loans will have all interest charges paid by the federal government while the student is enrolled in school on at least a half-time basis The interest on the unsubsidized Stafford loan will be the responsibility of the student and can be paid while the student is in school or added to the outstanding loan balance for payment after graduation

To be eligible for a subsidized Stafford loan a student must show financial need Students may borrow up to the amount of their need in the subsidized Stafford loan The student may then choose to borrow any remaining amount up to the federal maximum, in the unsubsidized Stafford loan program Freshman students may borrow a combined total through either program of up to $2 625/year Sophomore students may *borrow up to* $3 500/year and junior and senior students may be eligible for up to $5 000/per year with a $23 000 undergraduate maximum Until spring semester 1994, graduate students may *borrow up to* $7 500/year *Beginning with* spring semester 1994 graduate students may be eligible for up to $8 500/year with a $65 000 maximum including all undergraduate loans

For new borrowers the interest rate is a variable rate which is tied to the 91-day treasury bill plus 3 1 percent The interest rate is adjusted annually and is capped at 9 percent Repayment does not begin *until* six months after graduation For students who currently have 7 8 or 9 percent Stafford loans the interest rate on additional Stafford loans will continue to be 7 8 or 9 percent The Office of Student Financial Aid will provide a list of lenders from which you may secure a loan A FAFSA is required Students are strongly advised to counsel with a financial aid adviser as increased loan indebtedness occurs

F Federal PLUS/SLS Loans The interest rate for Federal Parent Loans to Undergraduate Students (Federal PLUS) and Federal Supplemental Loans for Students (Federal SLS) is tied to the 52-week treasury bill rate with maximum interest being 10 percent on the PLUS loan and 11 percent on the SLS loan Through the PLUS loan parents may borrow the entire cost of education less any financial aid the student is receiving There is no limit on loan indebtedness, although most lenders will conduct a credit analysis before disbursing any funds through the PLUS program

To be eligible for the Federal SLS program a student must be either an independent undergraduate student or a graduate/professional student Eligible freshman and sophomore students may borrow up to $4 000/year in the Federal SLS *program Eligible juniors and seniors may* borrow up to $5 000/year with a cumulative undergraduate maximum in the Federal SLS program of $23 000 Graduate/professional students may be eligible to borrow up to *$10 000/year in the Federal SLS program* with a cumulative total of $73 000

Students who borrow through both the Stafford and SLS programs can combine their maximum borrowing in either the subsidized or the unsubsidized Stafford and the SLS programs Thus an eligible freshman student could borrow a total of $2 625 in the Stafford loan program and $4 000 in the SLS program for a total of $6 625 for the year Cumulative undergraduate borrowing of $23 000 in the Federal Stafford programs and $23 000 in the Federal SLS program means a student could borrow a maximum of $46 000 through these programs while an undergraduate student Likewise a graduate student could borrow $8 500 per year in the Federal Stafford programs and $10,000 in the federal SLS program for a maximum of $18 500/year Total indebtedness for a graduate student through the Stafford loan programs and the SLS program cannot exceed $138 500 Students are strongly advised to counsel with a financial aid adviser concerning their loan indebtedness before combining several types of loans

G Federal Health Education Loan (HEAL) The Health Education Loan (HEAL) program is a federally insured loan program based on need for eligible students enrolled in the College of Veterinary Medicine Students may borrow up to $20 000 per year not to exceed *$80 000 for all years Repayment begins* six to nine months after the borrower ceases to be a full-time student Interest is computed based on the 91-day treasury bill s annual percentage rate

III. Part-time Employment

Employment opportunities are available for students to earn a portion of their educational expenses The job board outside of the Student Employment Center 6 Beardshear Hall is used for advertising part-time employment opportunities available to ISU students

Federal Cooperative Education Program This program combines classroom learning with paid work experience designed to develop students into the Federal Government s future professionals and managers The Federal Government seeks highly motivated flexible and creative students to fill co-op assignments across the country in laboratories, offices forests, parks hospitals, and in ocean and space programs in a wide variety of occupational fields There are two different types of work schedules alternate periods of work and study (full-time student one semester and full-time worker the next) or part-time (parallel periods of work and study) Students interested in the Federal Cooperative Education Program can contact the director of ISU Career Planning and Placement Services by calling (515) 294-9490

Internship Programs Most college departments offer internship programs to enhance the student s education and career preparation by integrating classroom theory with on-the-job performance These programs enable students to test career and professional goals develop confidence maturity and work-related skills and establish professional contacts and interests Contact the respective department for specific program information

Work-Study Programs Both federal and state funds subsidize need-based programs that permit students to be employed on campus or off campus in nonprofit agencies A portion of the students total earnings is paid by federal or state funds and the remainder is paid by the employing department Students apply for Work-Study by completing a FAFSA

University Student Employment University employment is available to all students who are U S citizens or those international students who have obtained a work permit Wages are paid 100 percent by the employing department On-campus job listings may be found on the job board outside 6 Beardshear Hall Students are also encouraged to seek additional campus job opportunities on their own Many students

who live in university residence halls apply for work in the residence hall food service to help meet the cost of room and board Students interested in food service employment may apply in the spring directly to the assistant director of residence in charge of food service Residence Department Friley Hall Iowa State University Ames Iowa 50012

Off-Campus Employment The off-campus employment program seeks part-time employment opportunities for students who would like to work while they are in school Restaurants hotels service stations and retail stores are examples of local employers that list positions with the Student Employment Center These jobs are available to any ISU student graduate or undergraduate regardless of financial need Jobs are listed on the job board outside the Student Employment Center Room 6 Beardshear Hall

IV Other Financial Aid

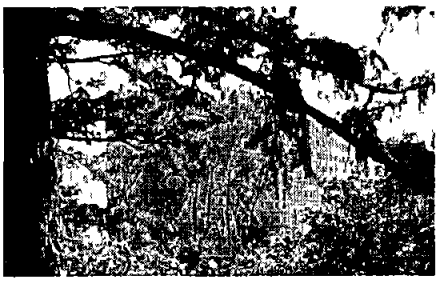
Many other forms of financial aid are available to students who qualify including Vocational Rehabilitation, Veterans Benefits and Department of Human Services programs For further information on these programs contact the appropriate government office

Military Officer Education (ROTC) Scholarships

Army The Military Science Department offers 4- 3- and 2-year Army ROTC scholarships to qualified students on a competitive basis in virtually any academic discipline These scholarships provide payment of tuition all required fees (except student health) books and supplies allowance and a monthly cash subsistence allowance For applications or additional information contact the Military Science Department at Room 132 Armory or call 294-1852

Navy The Naval Science Department offers several scholarship programs to qualified students The scholarships cover payment of tuition fees books and $100 a month Information is available from the Naval Science Department Room 3 Armory telephone 294-6050 or 294-0328

Air Force The Air Force Aerospace Studies Department offers Air Force ROTC scholarships covering two or three years of college which are available to qualified students The scholarships provide payment of tuition book fees laboratory fees and $100 a month Scholarships are available to students qualified in certain technical academic majors Details on scholarship qualification application procedures and eligibility are available from the Department of Air Force Aerospace Studies telephone 294-1716



Student Housing

Director Charles F Frederiksen M S

Associate Director Stewart L Burger (Food Service) M S

Assistant Directors Virginia C Arthur Ph D (Towers and Richardson Court) L R McFarlin B C S (Administrative Services) Carlton T Moen Ph D (University Student Apartments) Gary G Schwartz M A (Union Drive) James R Judy (Residence Halls Maintenance)

The university provides residence hall housing facilities for approximately 3 300 single undergraduate women 4 500 single undergraduate men 350 single graduate men and 200 single graduate women In addition there are 1 056 family apartments and apartment space for 170 single students Other students live in private rooms and apartments in Ames or nearby communities

Each newly admitted student to the university will receive a housing application form immediately following his/her admission The student s name will be placed on a list for room assignment according to the date the completed application and application fee are received in the Department of Residence Administrative Office Admission to the university is necessary before a housing application will be accepted

Address correspondence concerning undergraduate and graduate single student housing to the Administrative Office Department of Residence 1215 Friley Hall Iowa State University Ames, Iowa 50012 or to the Director of University Student Apartments 100 University Village Ames Iowa 50010 for family or single student apartments

Undergraduate Residence Halls

Most of the rooms in residence halls are planned for double occupancy however some of the rooms accommodate three persons and there are a limited number of private rooms All rooms are furnished with single beds innerspring mattresses chests of drawers individual study desks chairs and a telephone Students provide their own bed linens throw rugs blankets pillows towels and study lamps (except Maple Willow and Larch Halls where study lamps are furnished) Students are responsible for maintaining the cleanliness and order of their own rooms

Housing options include (1) room provided for academic year excluding academic breaks (2) room provided for academic year including breaks and (3) room provided for full calendar year including breaks (Union Drive-Friley only)

Cafeteria style food service is provided for all residents in the halls Students living off-campus may purchase a residence hall meal plan These meal plans may be purchased at 1215 Friley Hall Meal plan options include the following

20 meals per week (3 meals per day except Sunday evening meal)
15 meals per week (3 meals per day Monday-Friday)
14 meals per week (any 2 meals per day Monday-Sunday)
10 meals per week (any 2 meals per day Monday Friday)

A single student who resides in an undergraduate residence hall must sign a contract for room and board for the academic year or the remainder thereof if contract is signed after fall semester begins All charges are subject to change The rate for the academic year 1992-93 was $3 044 for a double occupancy room and full meal plan

Students may move out of the residence halls at any time during the academic year upon payment of room and board for the term of occupancy plus forfeiture of the prepayment and a charge of 8 percent of the remainder of the contract if the student remains enrolled If a student does not plan to live in the residence halls the entire academic year he or she should keep in mind the cost of terminating the housing contract If there are any questions concerning the residence hall contract each student is encouraged to check with the administrative office (1215 Friley Hall) before making the final decision

In addition to the basic necessities several special facilities are available for use by residents These include house dens for informal get-togethers and relaxing storage rooms for luggage and trunks, student government-purchased TVs newspapers, magazines lounge areas for meeting and entertaining guests vending areas for snacks, post offices within the residence halls indoor and outdoor recreation areas and intramural equipment owned by student government, coin-operated laundry facilities in each hall special study areas in each complex computer terminal rooms with access to the university VAX system private dining rooms for specially prepared house and organization dinners meeting rooms and offices for student organizations music listening and practice rooms and parking lots assigned to the residence halls

The residence halls are organized geographically into three autonomous student associations The Towers Residence Association (TRA) the Richardson Court Association (RCA) and the Union Drive Association (UDA) The students in each of these coeducational associations elect a group of executive officers who are responsible for coordinating association events and activities Each association funds and maintains a social program an intramural program a camera club, a ham radio club and numerous committees that supplement the total social educational development of the individual residents The three associations also are joined in an Inter Residence Hall Association (IRHA) with an all residence hall parliament and jointly sponsor the KUSR FM stereo radio station Residence Hall Week weekly movies scholarships leadership conferences etc

Each association is further organized into smaller living groups called houses These houses of 55 to 75 members are the foundation of Iowa State s residence hall

program Members of the houses elect their own officers and the majority of all programs are planned on a house participation basis The individual s educational experience is augmented by active participation in the total house program

There are 12 co-ed houses in the residence halls These houses have male and female students living at opposite ends of the house They have separate bathroom facilities but share lounge facilities and house activities

There are fifteen special interest houses in the residence halls Eight houses are quiet houses that place special emphasis on quiet hours in an academic atmosphere One house is a cross-cultural house four are alcohol-free houses where alcohol is not permitted in the house or at house social functions and currently two are smoke-free where smoking is not permitted anywhere in the house

Graduate and Adult Undergraduate Residence Halls

Buchanan Hall provides housing in 174 single-occupancy rooms and 108 double-occupancy rooms for single graduate students and single adult undergraduate students A suite-type room plan provides a semiprivate bath shared by the occupants of two single-occupancy rooms or two double-occupancy rooms Public areas include a lounge television room recreation area vending room laundry room and administration office All student rooms are air-conditioned and open for occupancy all twelve months

Westgate Hall has 80 double-occupancy rooms The suite-type room plan provides a semi-private bath shared by the occupants of two rooms There is a public area on the first floor and a lounge on each floor for use by the residents of the hall

Rooms in both Buchanan and Westgate halls are furnished with single beds mattresses chest of drawers window drapes individual study desks chairs and telephone service Students provide their own towels and study lamps All bed linens are furnished and custodial service is provided weekly

The room rate in Buchanan Hall as of June 1992 was $1 630 per academic year in a double-occupancy room or $2 140 per academic year in a single-occupancy room The room rate in Westgate Hall as of June 1992 was $1 570 per academic year in a double-occupancy room or $2 080 per academic year for a single-occupancy room A meal plan may be purchased to eat in a residence hall dining room with the same options available as for undergraduate students

Single Student Apartments

There are 34 two-bedroom apartments in Schilletter Village designated for use by single students The rate for these apartments as of July 1992 was $439 per month per apartment Each apartment houses from one to four students

The apartments are furnished with the same furniture used in the undergraduate residence hall rooms plus range and refrigerator Water service and trash removal are included in the rent Students pay their own gas electricity and telephone

Family Apartments

The university provides 226 apartments in Schilletter Village 500 apartments in University Village 174 apartments in Hawthorn Court and 230 apartments in Pammel Court for student families Rates for these apartments as of July 1 1992 were $300 per month for Schilletter Village $283 per month for University Village $266 per month for Hawthorn Court and $162 per month for Pammel Court Apartments are unfurnished except for ranges and refrigerators Water service and garbage removal are included in the rental Residents pay for their own gas electricity and telephone

Approximately 40 percent of Iowa State s student families live in university apartments The remainder find accommodations in private homes apartments and trailer courts in and near Ames or commute from surrounding communities

Applications for University Student Apartments will be accepted not more than one year in advance of attending the university Applicants must be currently enrolled students or students admitted to the university for a future term Assignments are made by date of application

Address correspondence concerning student apartments to the Director of University Student Apartments 100 University Village Ames Iowa 50010

Off-Campus Housing for Students

Availability and cost are factors to be considered when living off campus Sleeping rooms in older houses apartments and duplexes make up the bulk of off-campus housing

The Off-Campus Center 59 Memorial Union keeps a partial listing of off-campus rental units Other housing may be obtained through real estate agents local newspapers or by contacting individual owners

It is best that the student come to Ames well in advance of the time he or she plans to begin academic work as many units are rented 3 to 6 months in advance The single occupancy room rental rates average $150 to $200 per month Average rental rate per student sharing an apartment or house would be in the $200 to $250 range per month Board for students living in off-campus rooms may be obtained in residence hall dining rooms private restaurants or the Memorial Union

A meal plan is available in the Department of Residence to off-campus students that provides any one meal per day Monday through Friday while classes are in session Information may be obtained from the Administrative Office Department of Residence 1215 Friley Hall, Iowa State University Ames Iowa 50012-0003

Fraternities and Sororities

Of the 53 fraternity and sorority chapters on the Iowa State University campus 46 have chapter houses and provide housing for about 1,800 undergraduate students The eight historically black Greek fraternities and sororities do not provide residential facilities for members but are active in scholastic service and social projects

The chapter house facilities are similar to a private residence living room, den kitchen dining room laundry room etc The Greek Affairs staff in the Student Organizations and Activities Center provide advising program and services for the Greek chapters and organizations Local alumni work with each fraternity and sorority to ensure that the chapter structure meets all the state and local building safety and fire codes that are required with incorporation under the State Law of Iowa

The average cost of living in a fraternity or sorority chapter house ranges from $100 less to $100 more per year than living in the residence halls The cost includes room, board, and social dues Fees average $50 for a pledging fee and $150 for the initiation fee

Men may move directly into a fraternity house at the beginning of an academic year if they pledge a chapter that has a house Typically they continue living there throughout their college careers Women pledging a sorority during formal rush or informally throughout the year generally live in the residence halls for the academic year However as space becomes available in a chapter house sorority members often move into the house as sophomores or upper-class women

If a student moves into a chapter house from the residence halls and has to break a contract the student will forfeit the deposit and owe a percentage of the cost of the contract Most of the chapters compensate a student to a degree Because the compensation amount differs among houses a student should communicate with the chapter before changing residences

Student Services

The University Library

Dean of Library Services Nancy L Eaton M L A

The University Library collections total more than 5 1 million items including more than 1 9 million books and bound serials 2 5 million microforms and thousands of audio-video materials manuscripts films maps and archival photographs The library is nationally recognized for its holdings in the basic and applied fields of the biological and physical sciences and has a long-range program for strengthening collections in the humanities and social sciences Important holdings of many periodicals are maintained in botany chemistry entomology mathematics physiology veterinary medicine and zoology The library currently receives over 21 000 journals and other serial publications amounting to world coverage in many scientific fields

The library encourages use of its collections services and study facilities Instruction in the use of library resources is offered to graduate and undergraduate students

The main library collections and services are contained in the Parks Library Weekly exhibits of new books in all subjects are held in the New Book Shelving Area first floor Current issues of selected periodicals are displayed in the Periodical Room second floor The Reference Desk is found on the first floor as are the Microforms Center and the Reserve Desk The Media Center is located on the lower level The Department of Special Collections on the fourth floor includes the university archives historical documents and various photographic and archival collections

There are several subject reading rooms outside the main library including the physical sciences economics and sociology design and mathematics reading rooms A branch library is maintained in the College of Veterinary Medicine

The library provides access to local and national resources in several ways SCHOLAR the library s on-line system provides access to the library s local on-line catalog (ICAT) and selected subject databases that index individual journal articles Additional access to journal literature is also provided in the Reference and Instructional Services Department through a variety of print and automated resources

Student Counseling Service

Director Terry Mason Ph D

Assistant Director, Clinical Marty I Martinez Ph D

Assistant Director, Training Patricia G Anderson Ed D

Professional Staff Jean Chagnon Ph D James W Copley Ph D Gene Deisinger Ph D Martha S Norton M S Suzanne Zilber Ph D Meral U Culha Ph D Joseph R Triggs Ph D

Student Counseling Service provides a wide range of services to help students gain the most benefit from their college experience Counseling may involve self-understanding personal development choice of major or career communication skills or college adjustment Groups or workshops are offered for personal growth assertiveness career exploration stress management test anxiety management and alcohol education Support services are offered for students with learning disabilities and eating disorders and for survivors of sexual assault and adult children of alcoholics

Student Counseling Service (SCS) keeps the identity of its clients and the information shared in counseling confidential Career and personality testing are available There is no charge for regularly enrolled students

Other services include the Substance Abuse Prevention and Intervention Program Career Resource Center Learning Disabilities Assessment Orientation and Placement Testing and consultation and outreach services SCS is approved by the American Psychological Association as a training site and is certified by the International Association for Counseling Services

Hours are Monday through Friday 8 a m to 5 p m The Student Counseling Service phone number is 294-5056

Student Health Center

Director Robert K Patterson M D

Physicians Charlotte Cleavenger D O Rebecca Fritzsche M D Gary Jennett M D Patrick Kain M D Pauline Miller M D Alan Philippi D O Cosette Scallon M D Steven Sheldahl M D Lee Wilkins M D

The Student Health Center is located in the Student Services Building south of Pearson Hall and next to Alumni Hall Services include doctor and nurse consultations physical exams laboratory and x-ray services trauma care sports medicine and physical therapy immunizations pharmacy diet and nutrition consultation fitness consultation computerized health risk appraisal stress management wellness assessment workshops and referral services

A $40 student health fee which partially finances the services of the Student Health Center is charged to all students taking 5 or more credits each semester Those taking 4 or fewer credits may also access services at reduced cost by electing to pay the health fee Spouses of students who have paid the health fee may also pay the fee and have access to the same services Students with less than 5 credits who elect not to pay the health fee may still be seen at the Student Health Center but will be charged for the services provided International students and their spouses are required to participate through payment of the health fee This fee is not a substitute for health insurance It is a prepayment plan that complements the student s individual insurance coverage

Clinic hours are Monday through Thursday 8 a m -8 p m Friday 8 a m -6 p m Saturday 8 a m -12 noon The clinic operates on a walk-in basis as well as on an appointment system for physical examinations and procedures Each patient has the option of seeing the physician he/she requests

Service is available for emergency problems after regular clinic hours After hours care is available in the west end of the Student Services Building until 10 p m daily It begins at noon on Sundays After 10 p m and until 8 a m emergency services are available at Mary Greeley Medical Center Emergency Room The cost of such care is the responsibility of the student and/or the student s insurance plan

All records are confidential Student records are not available without the student s written permission

Placement Offices

Director Beverly S Madden M S 130 MacKay

Agriculture Roger Bruene B S 120 Curtiss

Business Steven Kravinsky M S 204 Engineering Annex

Design *Kathleen Halloran* B A 297 College of Design

Education Jacqueline Mitchell Ph D E106 Lagomarcino

Engineering Mary C Thompson M S 200 Engineering Annex

Family and Consumer Sciences Beverly Kruempel Ph D 131 MacKay

Liberal Arts and Sciences Steven Kravinsky M S 204 Engineering Annex

Veterinary Medicine William Reece Ph D 2527 Veterinary Medicine

Career planning and placement offices are operated in each college to assist students and alumni with their career-related needs They deliver a broad range of programs and services including computerized scheduling of on-campus interviews coordination of co-op and internship programs credential/ reference services sponsorship of workshops and seminars on subjects such as career exploration résumé preparation and letter writing off-campus job search techniques interview skill building preparing for the interview trip summer job search strategies getting into graduate and professional schools obtaining government jobs values clarification and adjusting to your first job

Each year the placement services provide or cosponsor four career information days a graduate/professional school information day an international opportunities festival and a summer job fair Each office also maintains a library of career-related resource materials and company information as well as current information on federal employment opportunities from the ISU Federal Career Information Center Alumni placement services are made available to graduates of all colleges Any placement office is able to serve as a point of entry to the entire ISU network of placement services

Office of Minority Student Affairs

George A Jackson Ph D assistant vice president for student affairs assistant dean Graduate College

Coordinator Al Campbell

The Office of Minority Student Affairs is designed to give leadership to the university s mission in the area of equal educational opportunity The office strives to maximize the educational and personal growth of students by identifying and assisting to develop and promote programs which will enable students and staff to achieve their fullest potential

In addition the Office of Minority Student Affairs works closely with all units in the university to achieve the following objectives

1 Increase the number of entering and graduating minority students

2 Review the concept of equal educational opportunity and recommend changes in university policy(ies) that may limit or prevent the achievement of educational and cultural goals of minorities

3 Ensure access and persistence of minority students in every discipline and area of study offered by the university

4 Maintain liaison with all departments and organizations interested in the growth and development of students

The above four objectives are designed to help evaluate the achievement of the major purpose of the Office of Minority Student Affairs **the identification, recruitment, retention, graduation, and placement of minority students** This purpose is accomplished through the following programs

George Washington Carver Scholarships Black Cultural Center Summer Enrichment Program Minority Graduate Student Program Martin Luther King Jr Short-term Loan Program sponsorship of symposia Bridge Mentoring Program Minority Engineering Program Visiting Scholars Program

Office of International Students and Scholars

Director Dennis Peterson M A

Assistant Director Brenda Thorbs-Weber Ph D

Coordinator of Study Abroad Trevor Nelson, M A T

Sponsored Student Coordinator Deborah Vance M B A

Coordinator of International Services Rebecca Matters

Coordinator of the International Resource Center Luiza Dreasher M A

Program Coordinators Corene Bakken M S Jane Edwards M S Patrick Green M A Ruth Meierdierks B A Ruth Osborn M A

The Office of International Students and Scholars (OISS) is committed to courteous accurate timely service and informative programming for 3 200 international students and scholars American faculty students and citizens of Iowa interested in international education Internationals attend orientation and other intercultural programs organized by OISS staff receive advice on personal concerns information on financial aid U S visa regulations university policies and community resources The International Resource Center develops and distributes cultural items from 190 countries to over 200 000 Iowans annually and also coordinates International Friendship Fairs with internationals visiting public schools The Study Abroad Center informs 2 000 Americans yearly on foreign study and work opportunities through individual advising group orientation meetings and other programs with recently returned students Staff assist faculty interested in developing new study abroad opportunities for ISU students OISS programs contribute to intercultural learning and understanding on campus and throughout Iowa

Dean of Students Office

Dean of Students Mary Beth Snyder Ph D

Assistant Dean, Student Advocacy Douglas Houghton J D

Assistant Dean, Student Organizations and Activities Lisa Norbury Kilian M S

Judicial Affairs Coordinator Grace Weigel M S

Services for Students with Disabilities Coordinator Joyce Packwood B S

Director, Student Support Services Program Carol Mahan M A

Academic Learning Lab Coordinator Mary Ann Rasnak M S

Adult Student Information Office Program Coordinator

Student Organizations Development Coordinator Carol Cordell M S

Greek Affairs Coordinator Julie Hays M S

Off-Campus Center Coordinator Ellen Fairchild M S

Student Legal Services, Student Legal Advisers Paul Johnson J D Mike Levine J D

Director of Recreation Services Larry Cooney Ed D

Intramurals Coordinator

Assistant Intramurals Coordinator Linda Martcke M S

Sports Clubs and Special Events Alan Murdoch Ph D

Facilities and Open Recreation Steve VanDerKamp M S

Recreation Personnel Services Coordinator Garry Greenlee M S

Outdoor Recreation Center Coordinator Scott White M S

Business Manager Kathy Berrett

Facilities Manager Gary Pejsha

Women's Center Coordinator Judy Jones Ph D

The Dean of Students Office provides a variety of services and programs outside of the classroom to enhance the personal development of students The office coordinates a variety of services that are each distinct and different but nonetheless similar in their orientation toward student development, involvement and service

Advocates in the office are available for students who may need assistance with their personal adjustment to college with an academic problem or with interpretation of university policies and procedures Advocacy and other special services also are provided for disabled adult and women students Educational programs and workshops in the areas of leadership time management and interpersonal skills are presented on an on-going basis and when requested by campus groups

Another service students find useful is the Campus Information Center where information on any campus-related topic may be obtained either by telephone or in person Recreation Services provides a wide variety of intramural and recreational activities for all skill levels Activities and programs for and about women are facilitated by the Women s Center The Student Organizations and Activities Center coordinates activities for fraternity and sorority chapters SOAC also registers and provides services and programs for student organizations

Student Organizations and Activities Center (SOAC)

The Student Organizations and Activities Center (SOAC) staff has compiled a list of organizations to better inform students of the opportunities available to them outside the classroom The list is available in the ISU telephone directory and in the Student Organizations and Activities Center 64 Memorial Union 294-1023

The Student Organizations and Activities Center was responsible for registering 540 student campus and community organizations last year The staff provides consultative services to student leaders members and advisers of organizations on an individual basis or in groups They also have staff who provide training workshops and facilitate retreats for student groups This office produces *Newsline* a newsletter distributed twice each semester to presidents and advisers of registered student organizations SOAC also annually publishes the *Student Organizations Resource Manual* which informs students and advisers about university policies and procedures that affect their organizations

SOAC works closely with ISU s fraternities sororities and affiliated Greek organizations They provide advising consultation, and educational services to the fraternities and sororities at Iowa State Professional staff and graduate assistants work with student leaders members and chapter advisers to provide support to the Greek system and to advise Interfraternity Council Panhellenic Council Black Greek Association, Greek Week and other student organizations affiliated with the Greek system SOAC is open Monday through Friday 8 a m to 5 p m

Fraternities and Sororities

The 35 fraternities and 18 sororities at Iowa State University have approximately 3 100 student members (1 900 men and 1 200 women) or about 15 percent of the undergraduate student population Local alumni work with each fraternity and sorority chapter to ensure that the chapter is meeting the educational objectives of the university and the national fraternity and the developmental needs of the student

Organizations and opportunities for involvement related to the fraternities and sororities are Interfraternity Council Panhellenic Council Black Greek Association Gamma, Greek Week Greekfest Junior Greek Council Order of Omega honorary and various task forces on fraternity and sorority issues as well as individual chapter leadership

Fraternities and sororities have been active with Iowa State University since 1875 Since that time over one-third of Iowa State s total alumni have graduated with fraternity/sorority affiliation

Margaret Sloss Women's Center

The Margaret Sloss Women s Center promotes the educational personal and career development of all university women Along with other departments the Women's Center shares the university s responsibility to create a safe and supportive environment for all individuals The Women s Center provides

- A clearinghouse of information including a lending library resource files a newsletter and a calendar of events
- A program center that focuses on helping students staff and faculty thrive in an academic environment by motivating them toward a greater understanding of and involvement with women s issues Programs include workshops leadership training local and national speakers on current issues coffeehouses special events weeks conferences and discussion groups
- An advocate for campus women who works toward changing situations which adversely affect them both individually and institutionally
- A space for women to meet study read discuss find support or relax
- A place to gain volunteer experience and credit as an intern practicum student student programmer board member or a volunteer

The Women s Center is open Monday through Friday, 8 a m -5 p m Phone 294-4154

Recreation Services

Recreation Services is dedicated to the provision of quality recreational opportunities for the campus community Programs include intramural sports sports clubs open recreation outdoor recreation special events and recreation facility scheduling Assistance for other recreational services is provided

The open recreation program includes the opportunity for recreational sports activity in Beyer Hall State Gymnasium Armory Physical Education Building (east campus) Recreation/Athletic Center outdoor tennis courts near Beyer Hall and Physical Education Building outdoor basketball courts near Beyer Hall intramural fields east of the Towers and Maple-Willow-Larch Residence Halls playfields north of Beyer Hall Clyde Williams Field and the new southeast field complex east of the football stadium

The outdoor recreation program is composed of four basic elements the camping-outdoor equipment checkout program the organized trip program basic instruction activity workshops the Outdoor Equipment and Resource Center All of these programs and activities are designed to provide opportunities for natural environment experiences Two regulation golf holes north of the Armory are open for ISU recreation golf use at no charge For more information drop in at the Outdoor Equipment and Resource Center Room 43 in the Armory (294-8200)

The sports club program is designed to serve individual interests in different sports club activities and is student-oriented in every respect Sports clubs offer team or individual recreational opportunities Following are the sports clubs badminton bowhunting bowling boxing cricket cycle cyclone sabres (fencing) equestrian flying frisbee hapkido hockey judo karate kayak lacrosse mountaineering racquetball rifle and pistol rodeo rugby sailing scuba ski sky diving soccer table tennis, tae-kwon-do, tennis trap and skeet volleyball water polo and weightlifting

These clubs offer instruction and competition at the local and intercollegiate levels Dues are set by the club members and most clubs receive financial subsidy from the Government of the Student Body to enable students to participate regardless of their financial situation

The intramural program involves competition among participants who enter as teams or individuals and play according to specific schedules There are a total of 80 intramural activities ranging from football to innertube water basketball and curling Activities include men s women s and co-rec divisions

Numerous special events add spice to the recreation program These activities are of an endless variety and usually take place in a short time span In general they encompass demonstrations performances special contests mass group participation social occasions excursions displays or special instruction

Other physical cultural and social recreation programs are sponsored in coordination with various departments organizations, and groups on and off campus For further information concerning campus recreation activity contact the Recreation Services Office 107 State Gym or call 294-4980

Adult Student Information Office

The Adult Student Information Office provides information for registered and prospective adult students concerning admission registration financial aid course selection and university procedures Career and personal counseling are also available A list of advisers in each department who are available to adult students is also maintained The office coordinates orientation events a sponsor program a Wednesday noon luncheon a weekly news update and publishes a newsletter each semester Specialized groups are offered such as a support group for women and an orientation workshop at the beginning of each semester *Office hours are available Monday through* Friday and some Saturday mornings Call 294-1020 for an appointment

Services for Students with Disabilities

Services for Students with Disabilities coordinates those support services that students may need in order to reach their *fullest academic potential As part of the* Dean of Students Office the coordinator serves as a resource within the university community concerning students who have a disability SSD provides advocacy information support counseling education referral and awareness to students faculty staff the Ames community and the state of Iowa Call 294-1020 VTDD 294-1021 for further information

The Academic Learning Lab

The Academic Learning Lab (ALL) is a learning how to learn center A walk-in service to students ALL helps them with tips on how to succeed in the classroom ALL is staffed with supervisors who work with students to pinpoint areas in their study strategies that might need improvement It is *also equipped with printed materials* computers and software all aimed at providing instruction and practice in effective college study skills

Student Support Services Program (SSSP)

This program provides academic support to eligible students and is designed to improve the retention and graduation rate of low-income first generation and disabled college students The needs of students accepted into SSSP are thoroughly assessed through testing and counseling SSSP students receive academic personal and career counseling academic advice tutoring and assistance in receiving financial aid Study skills workshops and basic skills instruction are also provided to correct weaknesses in math science reading and writing In addition, each semester cultural enrichment activities and trips are arranged These services are provided free of charge to eligible students after they are accepted into the program Call 294 0210 for further information

Student Conduct

Iowa State students are expected to seriously pursue their educational goals and conduct themselves in a manner that preserves an appropriate atmosphere of learning All students who enroll at Iowa State are expected to assume the responsibilities of citizenship in both the university and local communities

As a citizen of this academic community students are entitled to all the rights and protections enjoyed by other members of the community Membership in this community is purely voluntary and any student may choose to withdraw from it at any time that the obligations of membership seem disproportionate to the benefits While enrolled students are subject to university authority which includes the prerogative to discipline or dismiss those whose conduct is in violation of university rules and regulations

The president has delegated the authority to establish policy and to administer the discipline process to the All-University Judiciary Committee (See *Student Information Handbook*) Call 294-1021for additional information

Student Legal Services

Student Legal Services is a legal aid office available to any student enrolled at ISU Registered student groups are also eligible for services Student Legal Services is staffed full time by practicing attorneys who represent students in areas such as family law criminal law landlord-tenant law and consumer law Student Legal Services attorneys are willing to discuss almost any issue with a student but only a limited number of cases will be represented SLS is located in Room 129 Memorial Union and is funded by the Government of the Student Body Call 294-0978 for an appointment

Off-Campus Center

The Off-Campus Center is available to assist students with off-campus living The center has detailed information about living off campus and will provide special assistance to new students Computerized listings of rental units and roommates wanted are available at OCC

OCC also acts as an informational educational social and referral service for current and future off-campus students Housing codes and information about the responsibilities of both tenants and landlords are available through the center OCC represents student needs within the university and Ames communities and organizes social activities to provide a network for off campus students OCC is in the Memorial Union or call 294-2364 OCC is funded by the Government of the Student Body

Tutoring Services

The mission of the Tutoring Services staff is to enhance academic growth to remove barriers to learning and to promote human worth and dignity in ways that are enabling professional and service oriented Tutoring is the process by which students can get more individualized instruction for undergraduate courses offered at ISU Tutoring Services located in room 20 Student Service Building recruits and screens tutors works out convenient times to meet collects fees and pays tutors Call 294-6624

Student Life

Child Care

The Center for Childcare Resources can help relieve your anxiety and offer practical expert assistance from people who know the area The center is staffed with child care professionals who can serve you by
- Offering professional counseling about child care options in Ames
- Running a computer search to match your specific child care needs with available resources in Ames and surrounding communities
- Furnishing information on how to make informed decisions about choosing and monitoring child care

The Center for Childcare Resources (1038 Pammel Court 515-294-8833) will handle your inquiries at no cost whether you are a prospective student or currently enrolled

Five child care programs operate right on campus
- University Community Childcare
- The Comfort Zone Daycare for kids who don t feel so good
- Flex-care Part-time daycare for children of ISU students
- University Student Apartment Community Preschool
- ISU Child Development Laboratory School

For more information about these and other community programs the university child care coordinator is available at 515-294-8827

Forensics· Individual Events

ISU Forensics the Iowa State speech team participates in several kinds of competitive speech activities ISU Individual Events compete in the full range of individual events (public address and oral interpretation) and provides service to professional and educational associations Each year the Forensics squad travels almost 10 000 miles to compete in tournaments including Nationals ISU Forensics is a student-run organization funded by the Government of the Student Body It is a member of the Iowa Intercollegiate Forensics Association the American Forensics Association the National Forensics Association the Mid-America Forensics League the Twin Cities Forensics League the Missouri Valley Forensics League and has a chapter of Delta Sigma Rho-Tau Kappa Alpha the national forensics honorary Participation in forensics is open to all students with or without prior competition experience the only prerequisite is interest and determination

Honor Societies

Alpha Epsilon—Agricultural Engineering
The purpose is to promote the high ideals of the engineering profession to give recognition to those agricultural engineers who manifest worthy qualities of character scholarship and professional attainment and to encourage and support such improvements in the agricultural engineering profession that make it an instrument of greater service to humanity Membership is based on scholarship leadership and character

Alpha Kappa Delta—Sociology
Members are drawn from the sociology staff and from students majoring or minoring in sociology with 12 credits in sociology with a minimum 3 00 average and a 3 00 cumulative grade point average Objectives are to promote sociological research and enhance research conducted at ISU within the Department of Sociology

Alpha Lambda Delta/Phi Eta Sigma — Freshmen
First-year students who achieve at least a 3 5 GPA for one or more semesters their first year may be members of these national honor societies The purpose of the societies is to encourage superior scholastic attainment among students in their first year in institutions of higher education

Alpha Sigma Nu—Nuclear Engineering
The objective is to recognize scholarship integrity and potential achievement in applied nuclear science and nuclear engineering among outstanding students by means of membership in the society

Alpha Pi Mu—Industrial Engineering
Members are chosen for character achievement and scholarship in industrial engineering The group provides social and educational interaction for industrial engineering

Alpha Upsilon Alpha—Education
An educational honorary that recognizes and encourages scholarship and leadership in the field of reading

Alpha Zeta—Agriculture
Members must have completed three semesters of study in the College of Agriculture or Veterinary Medicine and be in the upper two-fifths of their class Meetings are held to foster high standards of scholarship character and leadership Alpha Zeta sponsors lectures service projects and promotes the agricultural programs at ISU

Cardinal Key—Senior Leadership
The Senior Honor Society of Cardinal Key recognizes those persons who have been outstanding leaders in college life who have rendered noteworthy service to Iowa State who are of high moral character and who rank high scholastically Members are selected by application and interview

Chi Epsilon—Civil Engineering
The purpose is to develop the profession of civil engineering through the interaction of members fellow civil engineering students and faculty Scholarship character practicality and sociability are the fundamental requirements for membership

Epsilon Pi Tau—Industrial Education and Technology
Members are selected from the upper one-fourth of the juniors seniors and graduate students in industrial education and technology The group strives to promote skill social and professional efficiency and research

Eta Kappa Nu—Electrical Engineering
Members are selected from the upper one-fourth of the junior class and upper one-third of the senior class in both electrical and computer engineering Eta Kappa Nu promotes scholarship and citizenship through guest lectures and service projects

Gamma Sigma Delta—Agriculture
Seniors who show promise of leadership in agriculture and who are in the top 15 percent of the class academically are nominated for membership Outstanding graduate students faculty and alumni are also nominated

Golden Key—All University
A national nonprofit academic honors organization Golden Key is dedicated to recognizing and encouraging scholastic achievement in all undergraduate fields of study and to uniting collegiate faculty and administrators

Honorary Order of Omega—Greek Affairs
A national Greek honorary the Order of Omega was founded at Iowa State in 1957 Criteria for membership include character scholarship leadership service to the individual chapter the Greek system the university and the Ames community Membership is limited to junior and senior students who comprise one percent of the Greek population

Iota Sigma Pi—Chemistry
Iota Sigma Pi is a national honor society for women in chemistry Its objectives are to promote interest in chemistry among women students to foster mutual advancement in academic business and social life and to stimulate personal accomplishment in chemical fields Members are elected on the basis of scholastic and professional record

ISU Couriers
ISU Couriers is a residence hall honorary for sophomores juniors and seniors who are interested in campus and community service and who maintain a 2 5 GPA Working with the Admissions Office the group conducts campus and residence hall tours assists IRHA in the promotion of residence hall life and is involved in a variety of community-oriented service projects

Kappa Delta Pi—Education
In an effort to promote excellence in and recognize outstanding contributions to education Kappa Delta Pi maintains a high degree of professional fellowship among its members quickens professional growth and honors achievement in educational work Membership invitations are extended to second semester sophomores juniors and seniors with a GPA of 3 25 or above

Kappa Omicron Nu, Gamma Chapter
Objectives of the honor society are to promote graduate study and research and to stimulate scholarship and leadership toward the well-being of individuals and families throughout the world Top 10 percent of junior and top 20 percent of senior students maintaining at least a B average and outstanding graduate students in family and consumer sciences are eligible for selection Research within the college is shared at monthly meetings

Kappa Tau Alpha—Journalism
Kappa Tau Alpha is the national society dedicated to the recognition and promotion of scholarship in the field of journalism Members are selected from the upper 10 percent of the senior class Graduate students and faculty who qualify are also eligible for membership

Lampos—Liberal Arts and Sciences
This liberal arts and sciences honorary may choose no more than one percent of the junior and senior classes Selection is based on outstanding character service leadership and scholarship

Mu Sigma Rho—Statistics
The objective is the promotion and encouragement of scholarly activity in statistics and the recognition of worthwhile achievement among undergraduate and graduate students and staff Members must have high academic standards

Omega Chi Epsilon—Chemical Engineering
Membership is open to chemical engineering juniors in the top 20 percent of their class or seniors in the top 30 percent The purpose is recognition and promotion of high scholarship original investigation and professional service in chemical engineering

Order of the Sextant—Naval Science
Members are selected on the basis of leadership scholarship and military aptitude Candidates for membership must be in their second year of NROTC have at least a 3 00 GPA and be ranked in the top 25 percent of their NROTC class The purpose is to prepare midshipmen for military service and to further the interests and prestige of the U S Navy and Marine Corps at Iowa State University

Phi Alpha Theta—History
Students who have a B average in at least 15 hours of history are eligible for membership The local branch sponsors social activities co-sponsors prizes for undergraduate essays in history and encourages students participation in state-wide regional and national Phi Alpha Theta conferences

Phi Beta Kappa—Liberal Arts and Sciences
Phi Beta Kappa is a national honorary society founded in 1776 to recognize and encourage scholarship friendship and cultural interests Membership is by invitation to students enrolled in the LAS curriculum To be eligible juniors must have at least a 3 80 cumulative grade point average and seniors at least a 3 60 average Other criteria for membership include requirements in the mathematical disciplines and a foreign language

Phi Beta Delta—International Scholars
Phi Beta Delta is a national honor society dedicated to addressing the need on campus for recognition and visibility of the international experience and to serve as a vehicle for the development of academic-based international programming It encourages interdisciplinary exchange of ideas and information among students faculty and staff Members are selected from domestic and international students and from distinguished faculty on the basis of scholastic achievement and international activities

Phi Delta Kappa—Education
Phi Delta Kappa is an honorary educational fraternity dedicated to research service and leadership Membership is by invitation only

Phi Kappa Phi—All University
This national honor society recognizes and encourages superior scholarship in all academic disciplines Membership is open to qualified undergraduates and graduates by invitation and occasionally to faculty and alumni

Phi Epsilon Omicron—Family and Consumer Sciences
Members are selected from junior and senior family and consumer sciences students who have demonstrated academic excellence and professional leadership qualities Membership is a means of furthering professional goals Outstanding graduate students are also eligible for selection

Phi Zeta—Veterinary Medicine
Phi Zeta is the national honor society of veterinary medicine whose aim is to stand for the constant advancement of the veterinary profession higher educational requirements and high scholarship Active members are students in the third and fourth year of the veterinary curriculum who have achieved high scholarship and those who have been in possession of a veterinary medical degree for at least two years and are engaged in a veterinary graduate program internship or veterinary research

Pi Alpha Xi—Horticulture
This honor society s purpose is to promote high scholarship foster good fellowship increase efficiency of the profession and establish cordial relations among the students educators and professional horticulturists Membership is open to academically qualified upperclass and graduate students in horticulture

Pi Kappa Lambda—Music
Members are chosen from senior music majors who are in the top 20 percent of their class The group promotes excellence in musical performance scholarship and research

Pi Mu Epsilon—*Mathematics*
Pi Mu Epsilon is the national mathematics honorary society whose purpose is the promotion of scholarly activity in mathematics among students and staff Members are students and faculty who have completed at least two years of college level mathematics with honor (at least 3 33 GPA) and have maintained an overall GPA of at least 3 0

Pi Sigma Alpha—Political Science
Pi Sigma Alpha attempts to bring persons especially interested in the study of government into closer association for their mutual benefit Candidates for membership are selected from graduate and upper-class students faculty and persons who have made notable contributions to political science Primary qualifications include high scholarship and demonstrated interest in political science

Pi Tau Sigma—Mechanical Engineering
Members are juniors and seniors in the upper ranks of their classes in mechanical engineering Meetings and social functions are held to recognize and encourage outstanding scholastic achievement

Psi Chi—Psychology
National honor society in psychology Recognizes and honors individuals maintaining high scholarship and documented interest in psychology

Sigma Gamma Epsilon—Geological Sciences
The objectives of this national honorary society are the scholastic and scientific advancement of its members and the promotion of friendships and assistance among colleges universities and scientific schools devoted to the advancement of the earth sciences Membership is intended for those scientists and students of science whose primary concern is the study of the earth

Sigma Gamma Tau—Aerospace Engineering
Sigma Gamma Tau is the national honorary for aerospace-aeronautical engineering students who have displayed outstanding scholarship leadership and personal characteristics Members are selected from the upper fourth of the junior class and upper third of the senior class who have maintained a 3 00 or better cumulative grade point average

Sigma Lambda Chi—Construction Engineering
The purpose is the recognition of outstanding students in construction engineering Upperclass students in construction engineering may be initiated into the society providing they have an overall scholastic average in the upper 20 percent of their class

Sigma Xi—Research
Sigma Xi the scientific research society is a broad-based scientific honor society with over 500 chapters and clubs at universities and nonacademic scientific institutions Sigma Xi awards associate membership to undergraduates and graduate students who have demonstrated research potential through participation in an original scientific research activity Full membership in Sigma Xi recognizes a significant scientific research contribution

Tau Beta Pi—Engineering
Tau Beta Pi honors engineering undergraduates, graduate students and outstanding alumni who have distinguished themselves in scholarship and by exemplary character Members are selected from engineering juniors in the upper eighth and seniors and graduate students in the upper fifth of their classes

Tau Sigma Delta—Design
Tau Sigma Delta s prime objective is to emphasize scholarship and character to stimulate mental achievement and to recognize students who attain high scholastic standing Membership is open to juniors and seniors who rank in the top 10 percent of their classes and to graduate students who rank in the top third of their classes

Theta Alpha Phi—Drama
Members are selected for the national honorary dramatics society from among students involved in Iowa State University theatre productions in acting and technical capacities

Upsilon Pi Epsilon—Computer Science
Upsilon Pi Epsilon is the national computer science honor society Its objective is the promotion of high scholarship and original investigation in the several branches of computer science The requirements for membership include at least 18 credits in computer science and a minimum cumulative grade point average of 3 25

Xi Sigma Pi—Forestry
Xi Sigma Pi recognizes outstanding juniors seniors graduate students and faculty members in forestry The objective is to encourage high professional standards in the profession of forestry and to promote fraternal relationships among foresters

Lectures

Throughout the academic year the Committee on Lectures brings to the campus a number of speakers eminent in national and international affairs the sciences and the arts In addition to giving formal lectures, a number of these speakers meet with students informally for discussions Through these lectures and discussions the students are given a well-rounded presentation on subjects and areas affecting their culture educational and economic philosophy and scientific development The Institute on World Affairs is an annual week of speakers and films on a topic of international interest held in the fall Spring semester the Institute on National Affairs is held with a topic of national concern as its focus Focus, an annual fine arts festival with emphasis on student creativity in the arts is held in the spring The Committee on Lectures also sponsors or cosponsors dramatic dance and musical events Students are encouraged to contact the lectures program office and become involved in the planning of these events

The summer session is highlighted by a number of lectures on a wide range of topics by members of the faculty with expertise in the subject area they are addressing In addition dramatic dance and musical events are scheduled

Memorial Union

The Memorial Union is regarded as the heart of campus life and the campus center of informal education at Iowa State University It is the meeting place and headquarters for most student organizations and houses several university functions Lectures exhibits films concerts banquets dances and other campus gatherings are accommodated in its meeting rooms and ballrooms

A cafeteria the Campanile and Cardinal dining rooms a grill catering service and a 24-hour vending area provide food service to the university community The Maintenance Shop one of the Midwest s most unique entertainment clubs hosts some of the finest in blues jazz rock and folk music performances—as well as live theater productions The Recreation Area offers bowling billiards pinball and video games also available is a large screen television area and quiet study lounges

Art is a way of life in the Union that includes special film showings galleries and a browsing library that offers reading music and video materials The Workspace studios are staffed and equipped for individuals who wish to express themselves creatively and the Outlet is a retail marketplace featuring original crafts paintings and jewelry A small quiet chapel is available for services weddings or meditation

Campus visitors may choose to stay overnight in the guest rooms on the third fourth, and fifth floors The Memorial Union also has a barber shop two automatic teller machines a TicketMaster outlet the University Book Store a copy center a self-serve post office and an attached 640 car parking ramp

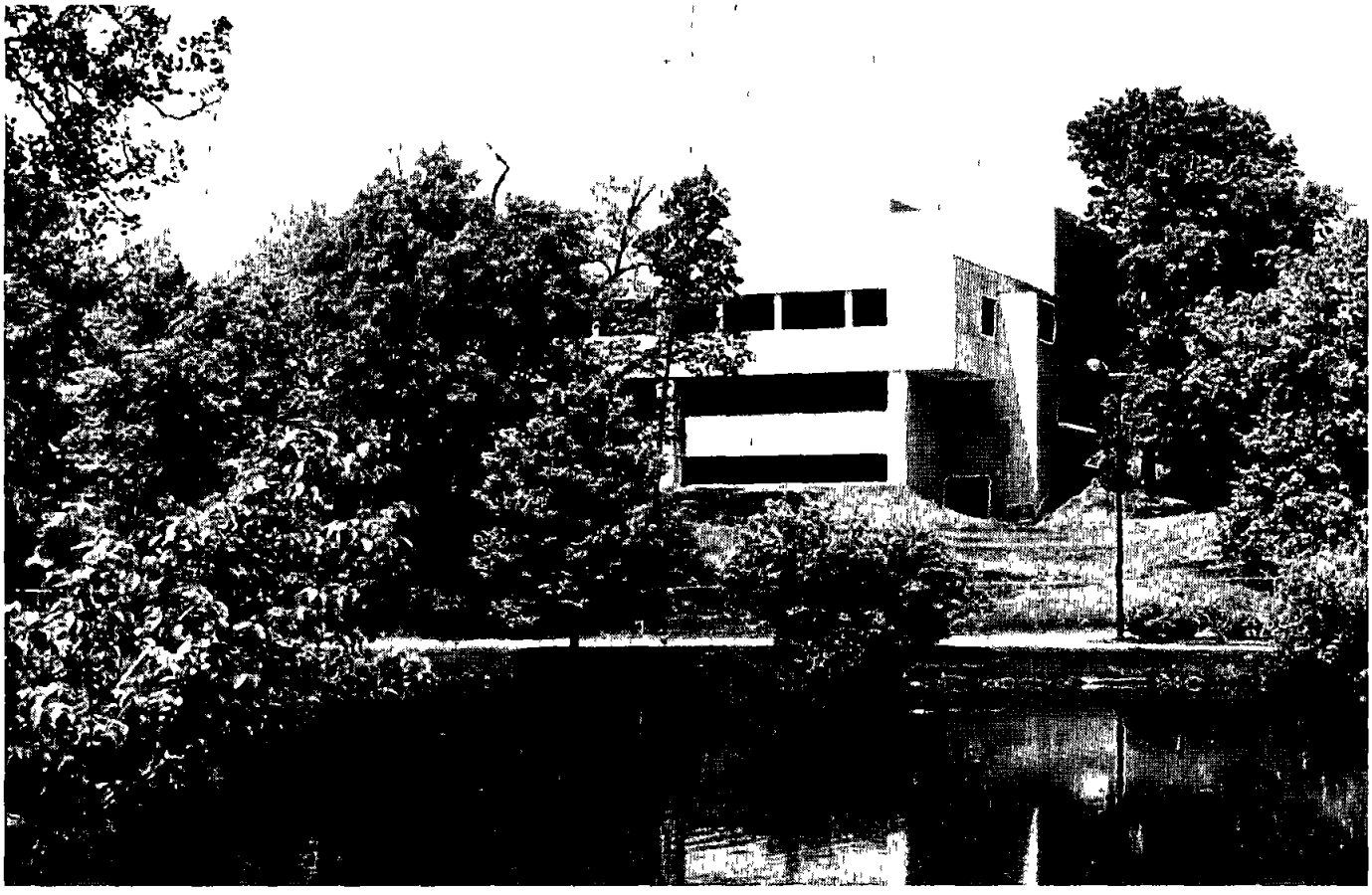
Opened in 1928 as a proud memorial to the Iowa State men and women who served in the Armed Forces during World War I the Memorial Union is now a living memorial to all Iowa Staters who have served in the United States military

Motor Vehicles and Bicycles

Students are permitted to own and operate motor vehicles—automobiles motor scooters and motorcycles Motor vehicles however are in no way necessary for an Iowa State student Those who operate a motor vehicle or bicycle must abide by the rather extensive traffic and parking regulations necessary because of the congestion on campus All motor vehicles maintained owned or operated by students on university property are to be registered with the Parking Division Office located in the Armory Fines are levied for infractions of these regulations

Music Activities

Many opportunities to perform and listen to music are provided Iowa State students The Department of Music offers a full instructional program including applied vocal and instrumental instruction music theory music history and literature and music education



The Department of Music offers a wide variety of opportunities to participate in large performing groups including five choral ensembles six bands ISU Symphony Orchestra and numerous chamber groups Nearly one-fourth of all undergraduate students participate in some aspect of music while attending ISU Campus concerts student operas musical shows the Holiday Festival of Music the Madrigal Dinner and concert tours are among the musical events offered

Musical events by world renowned artists are presented throughout the year in the Iowa State Center The Ames International Orchestra Festival has received worldwide acclaim for annually bringing at least one major symphony orchestra to Ames for a series of concerts In addition the Department of Music presents many faculty and guest artist recitals

Sigma Alpha Iota and Phi Mu Alpha professional music fraternities for women and men are represented on campus

Religious Life

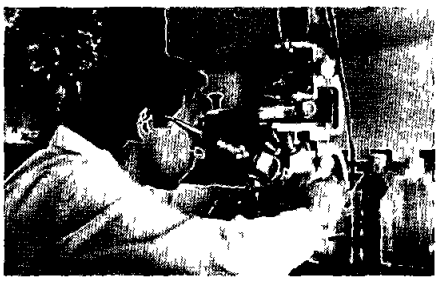
Iowa State is a state-supported nonsectarian institution but it recognizes the importance of spiritual life and cooperates with the many off-campus groups that fulfill the religious needs of the community

Most of the larger denominations have churches within easy walking distance of the campus A number of these have built attractive student centers in connection with the churches and conduct extensive student programs under the direction of professionally trained persons In addition a number of campus student organizations also address the religious needs of many students

Theatre and Dramatics

The Iowa State University Theatre Department of Music produces a season of at least five major presentations each year The season s bill endeavors to offer a variety of theatrical fare including a musical well-known dramatic literature and unusual and lesser-known plays Practical experience in all phases of theatrical production is open to all interested registered students within the university The season is partially subsidized by an allocation from the Government of the Student Body therefore all students paying activity fees may purchase tickets to a performance at the reduced student price

Other theatre-sponsored programs include student-produced plays readers theatre programs Theta Alpha Phi (a national dramatics honorary) the ISU Theatre Lab productions the Minority Theatre Workshop and the ISU Studio Theatre program



Research Organizations

Research is an important activity at Iowa State Faculty members engage in research pursuits as well as teaching Graduate students and in some cases undergraduates play an active part in this search for new knowledge

Support for research at Iowa State comes from state and federal appropriations as well as from contracts and grants involving the federal government and nonfederal organizations As part of its total program the university also operates extension services special laboratories centers and institutes

An abbreviated description of many of the various research organizations and their activities is presented here Additional information concerning any of these organizations and student research opportunities they support may be obtained from their administrative offices

Agriculture and Home Economics Experiment Station—David Topel director The Experiment Station supports research in the biological physical and social sciences to contribute to the advancement of the agricultural industry and to improve the economic and social conditions of families and communities Scientists in about 30 departments across campus work in campus laboratories at 12 outlying research farms and in the fields and business places of cooperators throughout the state Work of the station is organized into two dimensions—academic departments and research centers The research centers focus on problems that require an interdisciplinary research effort Research organizations administered by the station include

Center for Agricultural and Rural Development (CARD)—Stanley Johnson professor in charge CARD is devoted to agricultural economic policy research education and publication in both domestic and international arenas encompassing four broad areas trade and agricultural policy natural resources and conservation policy food and nutrition policy and rural and economic development policy

Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD)—D Michael Warren professor in charge The Center for Indigenous Knowledge for Agriculture and Rural Development (CIKARD) was established in 1987 Its goal is to collect indigenous information available to development professionals and scientists In addition to this clearinghouse function associates of CIKARD develop methodologies for recording these knowledge systems and conduct training courses and cross-disciplinary research on indigenous knowledge CIKARD maintains formal linkage relationships with similar centers in Wales the Netherlands and Nigeria

Leopold Center for Sustainable Agriculture—Dennis Keeney director Named for conservationist Aldo Leopold the center was established to conduct research on the environmental and social impacts of farming practices and to help develop and demonstrate profitable farming systems that preserve the productivity and quality of natural resources and the environment

Midwest Agribusiness Trade Research and Information Center (MATRIC)—William H Meyers director MATRIC is one of several international trade development centers established by the USDA It was founded in 1987 as a joint effort of ISU and the Greater Des Moines Chamber of Commerce to link the research capabilities of the university with the needs of agribusiness in Iowa and surrounding states The center is working to enhance trade in agricultural products produced by small-to medium-sized businesses in the Midwest

North Central Regional Aquaculture Center—Joseph E Morris associate director This center is administered jointly by Michigan State University and Iowa State University It is one of five regional centers established to develop collaborative interstate research and cooperative extension programs for commercial aquaculture—the culture or husbandry of aquatic organisms under controlled conditions

North Central Regional Center for Rural Development—Peter F Korsching professor in charge The center is supported by the land-grant universities of the North Central Region and the U S Department of Agriculture The major purpose of the center is to conduct a multidisciplinary research and extension program addressed to improving the social and economic opportunities of both farm and nonfarm people of rural America

North Central Regional Plant Introduction Station—Peter K Bretting research leader/coordinator One of four regional centers the station is a joint venture among the USDA Agricultural Research Service 12 north-central states and the Iowa Agriculture and Home Economics Experiment Station The station s three main areas of activity are (1) to grow and store seed to maintain viability of the seed collection (2) to conduct research and (3) to serve as a distribution center for plant scientists

Nutritional Sciences Council—Jerry L Sell chair The Nutritional Sciences Council consists of faculty members and qualified collaborators who are engaged in research extension or teaching in the nutritional sciences and closely related disciplines The council develops symposia on topics of international interest sponsors an interdepartmental seminar Modern Views of Nutrition and arranges short courses designed to fill specific needs in the total nutrition program

Seed Science Center—Manjit K Misra professor in charge The center is the focus of ISU activities related to seed Activities include seed services research training seed specialists and seed scientists and providing information to seed growers conditioners and sellers

Social and Behavioral Research Center for Rural Health—Rand D Conger director Research and educational efforts of the Social and Behavioral Research Center are directed toward improving the quality of life in Iowa s communities The center improves cooperative efforts among universities hospitals businesses and other state and community agencies in promoting rural health expands the knowledge base to develop and deliver innovative health promotion and care technologies improves accessibility to health services enhances the use of limited health care resources, and provides collaborative research and educational programming opportunities in the area of rural health for members of cooperating institutions and the communities they serve

Utilization Center for Agricultural Products—Dennis Olson director Increased utilization of agricultural products through development of new products new markets and new processing is the focus of the center It strengthens and broadens programs in the following existing ISU programs

Center for Crops Utilization Research—Lawrence A Johnson professor in charge The center conducts basic research on crop properties and applied research directed at developing products and processes that will expand demand for food crops such as corn and soybeans as well as demand for alternative crops It also acts as a technology-distribution center for processors export customers and foreign scientists and visitors

Food Safety Consortium—George W Beran, professor in charge The Food Safety Consortium consists of researchers from the University of Arkansas Kansas State University and Iowa State University It was

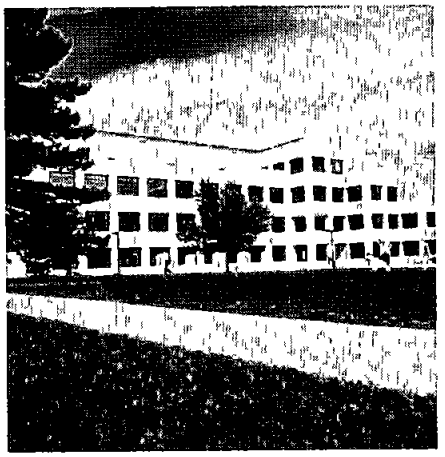
established by Congress in 1988 to investigate meat production in the poultry beef and pork industries from the farm to the consumer s table The goal of the multidisciplinary program is to improve food safety

Meat Export Research Center (MERC)—Dennis Olson professor in charge MERC conducts research to develop a stronger agricultural economy through increased exports of U S meats and meat products Research areas include trade policy cultural preferences in potential export markets and development of meat products and processing technologies MERC is a technology-distribution center for meat processors export customers, and foreign scientists and visitors

Biotechnology Council—Walter R Fehr chair The council composed of faculty members engaged in biotechnology research from the colleges of Agriculture Engineering Family and Consumer Sciences Liberal Arts and Sciences and Veterinary Medicine coordinates the university s interdisciplinary biotechnology program Council responsibilities include establishing and operating university-wide instrumentation facilities for molecular biology research recommending allocations of biotechnology funds and assisting in public education technology transfer and economic development activities

Center for Designing Foods to Improve Nutrition—Wayne R Bidlack interim director The Center for Designing Foods to Improve Nutrition was established at Iowa State University to improve nutrition and health maintenance through a more integrated understanding of food selection and consumption nutrient utilization and food production formulation processing and distribution Research focuses on designing new foods modifying food consumption nutrient utilization and food safety and policy alternatives and implications

Center for Immunity Enhancement in Domestic Animals (CIEDA)—James Roth professor in charge In 1987 Iowa State University established CIEDA to increase collaboration and communication among the many animal health scientists in the Ames area in the College of Veterinary Medicine and the Department of Animal Science and other basic science departments at the university and in the USDA Agricultural Research Service National Animal Disease Center and the USDA Animal and Plant Health Inspection Service National Veterinary Services Laboratories CIEDA s four principal activities are (1) preparing and administering research and graduate training grants (2) encouraging interaction between Ames scientists and industrial scientists in the CIEDA Industrial Affiliates Program (3) conducting public relations including preparing brochures assisting in planning national and international meetings and publishing a newsletter twice a year and (4) assisting in administering the Biotechnology Research and Development Corporation Animal Health Care Division which receives funds from the USDA and from member companies It calls for and funds proposals in areas of high priority for the member companies



Computation Center—George O Strawn director The Computation Center provides academic computing and networking for the university Instructional and research support ranges from microcomputing and local area networking to supercomputing and wide-area networking The center s research computing group is active in the development of advanced computing techniques and aids researchers in efficiently carrying out the computing needed for research projects The center also provides support for SCHOLAR the library s on-line information system and management services for Project Vincent high-performance workstations networked via a high speed campus backbone In conjunction with off-campus network connections Project Vincent provides computation capabilities for supercomputing visualization and numeric computation In the increasingly distributed academic computing environment the center seeks to promote computing standards and to achieve commonality of operations and economies of scale where appropriate

Engineering Centers The College of Engineering administers the following centers

Bridge Engineering Center—F Wayne Klaiber manager Faculty and student researchers at the Bridge Engineering Center study the design behavior repair and rehabilitation of highway and railroad bridges They work closely with state and national transportation departments and offer short courses and seminars on bridge inspection and rehabilitation for engineering professionals

Center for Building Energy Research—Howard N Shapiro and Michael B Pate co-directors The Center for Building Energy Research develops new technologies and improves existing ones to help reduce energy consumption while maintaining performance and productivity In joint efforts with industry and government center researchers develop refrigeration equipment that can allow for a rapid shift to new efficient and environmentally desirable refrigerant fluids The center also provides opportunities for technical and continuing education for engineering students practitioners building operators and others involved in building energy management

Center for Interfacial Materials and Crystallization—Glenn L Schrader manager The Center for Interfacial Materials and Crystallization conducts research into the chemical and physical phenomena that occur at interfaces—the thin films or layers at the boundaries between solids liquids and gases The properties of these interfacial materials are crucial to the preparation and use of a wide array of industrially significant materials Center researchers use advanced processing technology to develop new materials and then work with industrial partners to apply them to social and industrial needs

Computational Fluid Dynamics Center—John C Tannehill manager The Computational Fluid Dynamics Center uses powerful computers to solve complex engineering design problems associated with liquids or gases in motion This research has applications in aerospace and other industries for example significant funding from NASA has supported studies of flow fields around the space shuttle The center also administers interdepartmental course offerings in computational fluid dynamics

Electric Power Research Center—John W Lamont director The Electric Power Research Center promotes and expands research in electric power and energy-related fields attracts students and faculty to the power engineering field and develops seminars and short courses for professionals The center is an umbrella for the Power Affiliates Program an electric power research effort established in 1963 the Iowa Test and Evaluation Facility a research and demonstration facility founded in 1979 near Fort Dodge and the Power System Computer Service a program for conducting load flow and fault studies for a power systems network covering Iowa and the surrounding area

Energy Analysis and Diagnostic Center—Howard N Shapiro director The Energy Analysis and Diagnostic Center provides energy audits to small and medium-sized manufacturing companies and recommends ways to reduce their energy consumption and become more profitable ISU teams that include both professional researchers and students visit the site take data conduct analyses and write reports for each company

Geographical Information Systems (GIS) Facility—James Majure manager The GIS Support and Research Facility was established to support the use of GIS in research and education It provides hardware and software platforms and technical services for researchers to use for GIS-related projects The facility has seven Vincent workstations and a variety of input and output devices It also provides support and periodic training for GIS software products Software supported by the facility includes the ARC/INFO GIS software ERDAS for image processing and Oracle for relational data base management

Industrial Relations Center—Paula C Morrow director The central focus of research is on the behavior of individuals and organizations in an employment and labor force relationship It provides an interdisciplinary approach to related studies

Institute for Physical Research and Technology—David K Hoffman interim director The institute consists of a federation of basic and applied research entities (primarily U S government and industrially funded) The coordination and unified planning provided by the institute result in a significant enhancement of the overall effectiveness of the enterprise and facilitate the achievement of the specific goals and objectives of its components The laboratories and centers of the institute represent a major consortium for the pursuit of vital educational research technology transfer and technology development thrusts of the university state and nation These organizations include the following

Ames Laboratory of the United States Department of Energy—Thomas J Barton director The laboratory staff conducts basic and intermediate-range applied investigations that seek to discover new scientific knowledge improve understanding of natural laws and phenomena and develop relevant technologies pertinent to energy production conversion and transmission as well as to other critically important national programs The laboratory prepares scientists for work in the physical sciences engineering and energy-related fields through research appointments to Iowa State University graduate students and postdoctoral associates

Center for Advanced Technology Development (CATD)—Richard F Gaertner director The Center for Advanced Technology Development is a research and business development organization for technology transfer In this capacity it bridges the traditional gap between university basic research and industrial commercialization The technical work performed by the center is predominantly applied research in the field of materials and related technologies CATD broadly supports this type of research in other research and academic centers throughout the university

Center for Nondestructive Evaluation (CNDE)—Donald O Thompson director The Center for Nondestructive Evaluation sponsors an interdisciplinary program that conducts fundamental and applied research leading to improved NDE technology Research areas include ultrasonics electromagnetic techniques thermal wave imaging microfocus x-ray techniques artificial intelligence and expert systems with application to NDE measurements signal processing routines NDE of composites NDE for material properties and new instrumentations

Iowa Center for Emerging Manufacturing Technology (ICEMT)—James E Bernard director The mission of the Iowa Center for Emerging Manufacturing Technology is to develop ways to improve manufacturing productivity and to transfer manufacturing related technology to industry The center conducts interdisciplinary research that leads to improved manufacturing technology Research is conducted in the areas of concurrent engineering computer visualization off-line programming composites computational geometry design for manufacturability surface geometry acoustic diagnostics and design optimization

Iowa State Mining and Mineral Resources Research Institute (ISMMRRI)—William H Buttermore, acting director ISMMRRI provides opportunities for research in the field of mining and mineral resources through graduate education and research programs The institute is primarily involved with the education and training of graduate students through an interdepartmental minor in mineral resources conducting mineral- and mining-related research and disseminating research data and information through published reports and seminars

Microelectronics Research Center—David K Hoffman interim director The Microelectronics Research Center conducts mission-oriented basic and applied research on electronic materials, devices, and applications The center works closely with academic departments to promote and support graduate education in electronic sciences

Iowa Energy Center—John E Cummings director The State of Iowa created the center in 1990 to support efforts to increase energy efficiency in all areas of Iowa energy use The center is administered by Iowa State University with input from an advisory council representing Iowa educational institutions utilities and state agencies Competitive grants are awarded by the center to nonprofit organizations in Iowa including universities Research and demonstration projects supported by center grants focus on energy efficiency assessment of energy-related technology development of alternative energy systems based on renewable sources and educational programs encouraging energy efficiency Conferences and workshops are also supported through center grants

Iowa Space Grant Consortium—Wallace W Sanders Jr director The Iowa Space Grant Consortium is a collaborative effort of Iowa s three Regents institutions To achieve its goal of statewide awareness of and participation in space science and engineering it sponsors a number of activities like the Iowa Satellite Project a student-designed and operated small satellite gathering meteorological and soil condition data over Iowa The consortium also offers graduate fellowships undergraduate scholarships and summer research opportunities for undergraduates

Iowa Transportation Center—Thomas H Maze director The center's research arm is the Midwest Transportation Center a joint venture of Iowa State University the lead institution and the University of Iowa It is a research center for Region VII under the U S Department of Transportation s university transportation centers program Multidisciplinary inter-university research is conducted collaboratively with other public agencies and the private sector in Missouri Kansas Nebraska and Iowa Major goals of the center are (1) to conduct technical management and policy-oriented research that provides fundamental knowledge toward the solution of regional and national transportation problems and (2) to provide educational services and the dissemination of research findings to public officials policy makers transportation practitioners and the general public

National Soil Tilth Laboratory—Jerry L Hatfield director The laboratory is a federal research facility administered by the Agricultural Research Service, U S Department of Agriculture at Iowa State University Activities involve research on the fundamentals and management of soil tilth to solve national problems such as maintaining water quality enhancing soil quality controlling soil erosion and developing a profitable sustainable agriculture The laboratory has a scientific staff from the areas of agronomy soils physics chemistry microbiology agricultural engineering and agricultural economics

Statistical Laboratory—Dean L Isaacson director This research and service institute that conducts research in statistical theory and methodology It promotes and fosters the use of sound statistical methods in university research through on-campus consulting Similar consulting aid research cooperation and services are extended to off campus groups other colleges and universities and government agencies when such activities are of mutual benefit or otherwise in the public interest

Veterinary Diagnostic Laboratory—Vaughn A Seaton head The laboratory provides a research teaching and service facility to which the veterinary medical profession may bring animal health problems for counsel and diagnostic assistance Disciplines utilized are pathology bacteriology virology serology chemistry and toxicology A graduate residency program for pathology microbiology and toxicology is active

Water Resources Research Institute—Dennis Keeney interim director The institute coordinates and administers an interdisciplinary program in water resources research It administers the research funds received from the U S Department of the Interior as made available through the Water Resources Research Act of 1983 and from the State of Iowa Funds received from private state and federal sources are allocated for research in all aspects of water resources directed primarily at solving state regional and national water problems Technology transfer and information dissemination are additional elements of the program

World Food Institute—D Keith Whigham interim director The World Food Institute analyzes food and nutrition problems, generates solutions and suggests means for implementation prepares people to solve food and nutrition problems disseminates relevant information and studies interrelationships between the countries of the world and the United States with particular emphasis on Iowa

College Research Institutes

Agriculture and Home Economics Experiment Station—See description at the beginning of this section

Business Research Institute—David L Shrock director A component of the College of Business's mission is to create and disseminate knowledge and to offer innovative programs to prepare managers and leaders for a technologically oriented world The BRI plays an important role in carrying

out this mission Through the institute support is provided for applied research by college faculty and graduate students resulting in the advancement of new knowledge for the business world A concerted effort is made to encourage research within each of the college s departments

Engineering Research Institute—David T Kao director The institute coordinates staff research in areas involving all engineering academic departments and maintains major laboratories and technical service groups to support the various research programs Funds are derived from state appropriations and from industrial and government grants or contracts Activity is directed toward graduate instruction basic research and applied research

Family and Consumer Sciences Research Institute—Beverly Crabtree director The focus of the institute is to improve the quality of life for individuals and families through basic and applied research Graduate education support of college research facilities and staff support comprise the bulk of the remaining activities

Institute for Design Research and Outreach The institute coordinates and facilitates research artistic and creative design efforts of faculty and graduate students of the College of Design It also coordinates the integrated outreach efforts of the college by providing a linkage between design extension and the research and instructional efforts of the college The institute maintains the Design Simulation Laboratory the Design GIS Laboratory, and the Architecture Technology Laboratory

Liberal Arts and Sciences Research Institute Research programs in the College of Liberal Arts and Sciences are sponsored coordinated and administered through the Liberal Arts and Sciences Research Institute Its primary objective is to encourage basic research and creative scholarship in the five major areas included in the college—the humanities the social sciences, the biological sciences the physical sciences and the mathematical disciplines These activities are carried out with support from the institute by faculty members of the college and by graduate students working in these areas In addition the institute works closely with other research agencies both on campus and off and administers externally funded research within the college

Research Institute for Studies in Education—Norene Daly director The Research Institute for Studies in Education (RISE) provides leadership for and participates in research and contract and grant activities conducted by faculty staff and students of the College of Education RISE promotes and conducts research that is directly related to the mission of the College of Education and Iowa State University of Science and Technology RISE emphasizes efforts to secure external funding for research and development activities related to the mission of the college and the university The institute provides linkage with other units on and off

campus and facilitates collaborative research activities through financial and personnel support To support its mission RISE is organized administratively into two primary components research and contracts and grants

Veterinary Medical Research Institute The institute is multi-disciplinary with a responsibility to conduct research and offer research training in animal diseases Research and research training are conducted in the areas of viral bacterial and parasitic diseases immunology and basic biology

University Extension

The mission of ISU Extension is to provide research based unbiased information and education to help people make better decisions in their personal community and professional lives Fulfillment of the ISU Extension mission depends on a shared commitment by the entire university and an organizational structure that links the people of Iowa to ISU and to other sources of knowledge around the world

ISU Extension has an office and staff in every one of the 99 counties of Iowa These offices provide a local presence for the university and allow Iowans to contact a local office with their questions and concerns

ISU Extension has five units focused on serving clients external to ISU and one unit to help ISU faculty departments colleges etc with their outreach activities These units are described briefly here

Extension to Youth and 4-H
This unit helps youth become self-directing and contributing members of society 4-H experiential learning is founded on a knowledge base from this and other land-grant universities

Extension to Families
The Extension to Families unit provides education for families on aging child care consumer decisions family financial management family relationships housing choices nutrition and health parent education and public policy affecting families

Extension to Communities
ISU Extension to Communities helps organizations and local governments develop and build their capacity to make Iowa communities better places to live and work The aim is to help Iowa communities analyze and understand their needs identify alternative courses of action make informed decisions plan for the future and evaluate their efforts

Extension to Agriculture
Agricultural programs serve primarily producers and agricultural support service industries statewide through education and service Agricultural programs lead to increased profitability through enhanced management and marketing in an environmentally and socially acceptable system

Extension to Business and Industry
The aim of ISU Extension to Business and Industry is to assist Iowa s business community—especially contractors consultants manufacturers the food service industry and utilities—to maintain and to increase their profitability This unit includes the Center for Industrial Research and Service (CIRAS) the Center for Professional and Executive Development (CPED) and Professional Outreach Programs in Engineering

Continuing Education
ISU Continuing Education helps faculty and staff reach adult learners Off-Campus Credit Course Services staff work with faculty departments and colleges to provide credit courses and degree programs for off-campus (and often non-traditional) students Conference Services staff help faculty departments and others present short courses seminars satellite video programs and meetings for Continuing Education Units (CEU s) or on a non credit basis to audiences that range from 20 to 20 000 participants

Academic Life

The Academic Advising Program

Iowa State University s academic advising program strives to enhance the student s intellectual and personal growth to sharpen the student s decision-making skills and to integrate the student s academic and future career plans

Each student is assigned an adviser when he or she arrives on campus usually a faculty member or professional adviser in the department in which the student is majoring If a major has not yet been declared a member of the college faculty or staff will be assigned as adviser The adviser can serve as a primary resource for the wide variety of university support services available to Iowa State students but it is the student s responsibility to ask for assistance

Advisers assist in the development of an academic program that meets students career objectives as well as curriculum requirements Advisers can help students achieve their academic objectives by advising them about course requirements recommended electives and procedures for registration and schedule changes **It is the student's responsibility, however, to be informed about the requirements for his or her degree and to insure that these requirements are met** Advisers will however help students to get the most out of their educational experience

In most departments students may change advisers if they wish To do so they should first obtain the agreement of another member of the department to become their adviser and then request permission from the department for the change they want to make Students who wish to change advisers but do not know the professional emphases of the advisers in their department or for any other reason are unable to obtain the services of an adviser should ask their department or college office to assign them to an adviser

Enrollment in Courses

Responsibilities of the Student, Adviser, and College Classification Office Staff in the Registration Process

Registration at Iowa State begins with a meeting with an academic adviser The registration process includes advising enrollment in courses and schedule changes This process involves the student the student s adviser and the classification staff of the student s college each of whom is responsible for knowing and following the academic policies and procedures described here

The **student** is responsible for knowing university policies and procedures with respect to registration and schedule changes and for carrying out those procedures The student is responsible for the accuracy of his or her schedule including schedule adjustments (e g adds drops section changes) The student is also responsible for knowing the degree requirements of his or her major and/or curriculum for planning course schedules to meet those requirements and for monitoring the accuracy of the advisement/degree audit

The **adviser** is responsible for being available to consult with advisees during the advising/registration period for providing information about the requirements of the student s major and curriculum for providing guidance in the student s selection of courses for assisting the student in monitoring the accuracy of the advisement/degree audit and for notifying the college classification office if corrections to the advisement/degree audit need to be made

The **college classification staff** is responsible for assisting new and reentering students with the registration process for resolving unusual scheduling problems and for updating the advisement/degree audit

The **dean*** is responsible for making decisions with respect to requests for deviations from university policies deadlines etc

Registration

Registration and the payment of assessed fees are required of all who attend classes Enrollment is not complete until all fees are paid including board and room fees for those living in residence halls

Once students are enrolled at Iowa State they will register each semester for the following semester as long as they continue to be students Registration is a process by which students become officially enrolled in the university for a given term It involves students selecting courses they wish to take in consultation with their adviser enrolling in courses by means of touch-tone or walk-through registration and making necessary schedule changes

Registration takes place in the middle of the semester and lasts four weeks Registration for summer session should be completed during the previous spring at the same time

*Check with your college office to find out who is authorized to grant approvals or exceptions on behalf of the dean

as registration for fall semester The advising period begins three days prior to registration Students **must** see their adviser before they may enroll in classes Advisers will provide materials that students must have before their registration can be processed

Dates for advising and registration are included in the *University Calendar* in the *Schedule of Classes* and in the *Iowa State Daily* and are posted on departmental bulletin boards

All students are encouraged to register for courses though the Touch-tone Registration System If they are unable to or choose not to register through the touch-tone system a walk-through procedure is also provided Students who do not register by the published deadline for initiation of a schedule through the touch-tone system may use the walk-through procedure to process their registration

Students will be assigned a registration start date which is the first day and time on which they may enroll in classes for the next term The registration start date is included in the materials advisers provide In general registration start dates are assigned according to each student s projected year-in-school based on the sum of total credits earned and current term credits Students may choose to delay their registration until a later date but courses will begin to fill on the first day of registration and any delay may reduce chances of being scheduled into the courses they wish to take

To register for classes, students will need the following materials
1 A Touch-tone Registration Worksheet which their advisers will provide

2 A *General Catalog* available for a fee in the university and campus bookstores

3 A *Schedule of Classes* accessible on CYNET available for use at the reserve desk of the Parks Library and in departmental and college offices and available for purchase at the bookstores

4 Other departmental information which advisers can provide

Steps in the advising/registration process students should follow are
1 **Meet with their adviser,** who will

a give them their advisement/degree audit

b provide guidance in the selection of courses and alternatives

c sign their Touch-tone Registration Worksheet and

d give them their Registration Authorization Card (Students whose adviser does not have a Registration Authorization Card for them may present their Touch-tone Registration Worksheet with their adviser s signature to the Registrar s Student Scheduling Office 10 Alumni Hall where a duplicate authorization form will be prepared for them)

2 **Choose specific sections** of each course Choice of sections is the student s responsibility and in most cases advisers will not be involved in the selection of meeting times

3 **Review their Registration Authorization Card** to find

a the first day and time when they may register

b their personal access number (printed on the Registration Access Card a tear-off section in the lower right portion of the authorization card)

c any registration holds which will delay their registration if not resolved

d the date on which their schedule will be mailed and the address to be used for that mailing and

e fee assessment information which they need to edit

4 **Enroll in courses through the Touch-tone Registration System** Detailed instructions for registration through the touch-tone system are printed in the *Schedule of Classes* and are available on CYNET

In order to access the Touch-tone Registration System students must use their student I D number in combination with the Personal Access Number printed on their authorization form Students will be held accountable for all changes made to their schedules through the Touch-tone Registration System To ensure the security of their schedule students should memorize or record their Personal Access Number in a secure location and destroy the Registration Access Card portion of their authorization card If students lose their Personal Access Number they may present their approved Touch-tone Registration Worksheet at the Registrar s Student Scheduling Office 10 Alumni Hall to find out or change their current Personal Access Number

If students do not have access to a touch-tone telephone or for any other reason are not able to register through the touch-tone system they may process their Touch-tone Registration Worksheet at the Registrar s Student Scheduling Office 10 Alumni Hall

If students have any holds on their registration they will not be permitted to start registration until the holds have been released by the initiating offices If students attempt to register before their holds have been released the voice response will indicate which offices have placed holds on their registration

As students enroll in classes through the touch-tone system there will be a voice response after each entry that indicates whether each request has been processed As requests are processed students should keep a record of the courses scheduled on their Touch-tone Registration Worksheet When the touch-tone registration is complete students will know which sections have been scheduled and the meeting days and times for all sections on their schedule Students who lose their worksheets or need to review their schedules may call to request a list action through the touch-tone system and their schedules will be read aloud

Students who need to add courses or make other schedule changes may process their requests through the Touch-tone Registration System The last day for adds and section changes through the touch-tone system is the Friday before the first day of classes The last day for drops through the touch-tone system is the fifth day of classes

Each student has a credit limit for registration For fall and spring semesters this limit is 18 credits for undergraduates and 15 credits for graduate students For summer session the limit is 12 credits for undergraduates and 10 credits for graduate students If students attempt to add a course beyond their credit limit their add request will be denied and they must drop credits before they may add In some cases the college may approve a higher or lower credit limit for individual students If students need to request a change in their credit limit they should contact their adviser Advisers should notify the student s college classification office if the credit limit should be changed

Some courses or sections are restricted to students who meet specified criteria including curriculum/major college and/or year in school In addition some sections may be restricted to new students to ensure that sufficient spaces are available when new students register during June orientation If a student has extenuating circumstances and the department agrees to waive the restriction for a course, the student must obtain the designated departmental signature on a Schedule Change/Restriction Waiver form and process the form in the Registrar s Student Scheduling Office 10 Alumni Hall

Some sections are designated in the *Schedule of Classes* as Permission required Students may not enroll in these sections through the Touch-tone Registration System To add such a section students must obtain the instructor s signature on a Schedule Change/Restriction Waiver form and process the approved form in the Registrar s Student Scheduling Office

In some cases sections may be canceled due to low enrollment or departmental staffing considerations If students enroll in a section that is subsequently canceled they will be notified by the Registrar s Office by the department and/or on their printed schedule

Disabled students who need assistance with any phase of registration should contact the Registrar s Student Scheduling Office 10 Alumni Hall

5 **Walk-through registration** (applicable only to students who do not enroll in courses through the Touch-tone Registration System) The procedure for walk-through registration is the same as the touch-tone registration procedure described above except for the

use of the telephone to enroll in classes Students using the walk-through registration process must present their Touch-tone Registration Worksheet with their adviser s signature to the Registrar s Student Scheduling Office 10 Alumni Hall where their schedule will be processed On the Friday before the first day of classes registration is held in the Sun Room of the Memorial Union except for summer when it is held in Alumni Hall

6 **Students' schedules, data verification forms, and registration receipts** will be mailed approximately one month before classes begin It is the student s responsibility to review this information and contact the Registrar s Office if there are any changes or corrections that need to be made

Schedule changes processed before schedules are printed will be reflected on the printed copy of student schedules If students subsequently change their schedules they should be sure to note the changes on the printed copy of their schedule Students will not receive an updated schedule if they process additional changes after their schedule is printed All changes processed before the first day of classes will be reflected on beginning class lists so that instructors will be informed as to which students are officially registered as of the first day

Payment of Fees

Students will be billed by the Accounts Receivable Office for tuition room and board and various other university charges A statement of charges will be mailed on the first of each month to each student s in-session address It is the student s responsibility to ensure that the Office of the Registrar has a correct billing address If a student does not receive a billing statement before the term begins he or she should go to the Accounts Receivable Office to obtain the amount of his or her account balance due Failure to receive a billing statement will not exempt students from late penalties or from having a hold placed on their registration

Students who do not complete their registration before the first day of classes will be charged a late registration fee of $20

Students who do not pay fees by the deadline printed on the billing statement will be assessed a late charge equal to one percent of the amount indicated as the minimum amount due They will also have a hold placed on their registration until payment of the minimum amount due has been made

If a student s registration has been canceled for nonpayment of fees he or she may be reinstated with written permission from the college and will be assessed a reinstatement fee of $20

Most university fees are payable in three installments for fall and spring semesters Payments for fall semester will be due September 15 October 15 and November 15 Payments for spring semester will be due February 15 March 15 and April 15 Students will be charged a $10 administrative fee if they elect to use the deferred payment option Students who do not pay their first payment in full will automatically select the deferred option

Students who have past-due accounts receivable charges prior to the beginning of classes will be dropped from enrollment if these past-due charges are not paid before the first day of classes

Additional Registration Regulations

Registration should be completed by the end of the fifth day of classes To register after the fifth day of classes students must obtain written permission from the instructors of the courses they plan to take as well as approval of the dean* of the college in which they are registered During the summer session these approvals must be obtained in order to register after the third day of classes

Registration for a given semester is closed after the tenth day of classes and after the fifth day of classes for summer session

Students may not enroll in courses with time conflicts without the approval of the departments concerned

Students who participate in off-campus experiences for which they receive Iowa State credit must register for that credit during the term when the experience is taking place even though they may be taking no courses on campus during that time

Students may obtain academic credit for an activity either on or off campus for which they are also paid provided that they engage in an academically relevant activity beyond that for which pay is received Arrangements for receiving credit must be made with a faculty member in an appropriate department and must include agreement on (1) the academic objectives which the activity is expected to achieve and (2) the procedure by which the student s learning will be assessed This policy does not apply to registrations for R credit

Validation of Enrollment

To validate their enrollment in each course at the beginning of the semester students must attend the first or second meeting (first meeting if the class meets only once a week) Students who add a course after the term begins must attend the next class meeting The instructor has the option to offer a registered place in the course to another student when a registered student fails both to attend and to obtain prior approval of the instructor However those students will not be automatically dropped from the course they must drop the course themselves or they will receive an F grade

Making Schedule Changes

Procedures for schedule changes vary by the time period of the semester as follows

Period 1 ends on the fifth day of classes of the semester Schedule changes during period 1 are free and do not require instructor or adviser signatures Course drops during this period do not count toward a student s ISU course drop limit and will not appear on a student s grade slip or permanent record Schedule changes during period 1 may be processed through the Touch-tone Registration System or by presenting a Schedule Change/Restriction Waiver form to the Registrar's Student Scheduling Office

Period 2 ends the second Wednesday after the day midterm grades are due During this period schedule changes require signatures of adviser and instructor and are processed on a Schedule Change/Restriction Waiver form A $5 fee per schedule change form is assessed for adds drops and section changes during this period Course drops after period 1 count on a student s ISU drop limit and appear as an X on the grade slip and permanent record except for those drops judged by the dean* to be beyond the student s control

Period 3 follows period 2 and extends through the remainder of the semester Schedule changes during this period are permitted only for extenuating circumstances beyond the student s control require a written statement of support from both the instructor and the adviser and must be approved by the dean of the student s college

Specific deadlines for adding and dropping **half semester courses** are published in the University Calendar Appropriate adjustments to add and drop deadlines are made for half-semester and other partial term courses

Drop Limit

Students are limited in the number of courses they may drop during their academic career (This refers to drops processed after the fifth day of classes of each semester) Students who entered Iowa State as a freshman are allowed to drop a maximum of five courses during their undergraduate career If they entered at a level above freshman classification or in the College of Veterinary Medicine they are allowed to drop a maximum of four courses Courses dropped during their first term at Iowa State are not included in this limit nor does the summer count as a first term for this purpose Students who enroll at Iowa State after receiving a bachelor s degree are permitted two drops

Exceptions may be made for courses that must be dropped for reasons beyond the student s control These exceptions are granted only by the dean* of the student s college

The number of drops students have left is indicated on their grade slip each term Each student is responsible for not exceeding her or his limit Students who attempt to drop a course beyond the limit without special permission of their dean* will continue to be enrolled in the course and will receive a grade at the end of the term

Enforcement of Course Prerequisites

A prerequisite indicates the specific academic background or general academic maturity considered necessary for the student to be ready to undertake the course Since an instructor has the prerogative to direct a student who lacks a stated prerequisite to drop the course students are advised not to enroll in a course for which they lack a stated prerequisite without checking first with the

*Students should check with their college office to find out who is authorized to grant approvals or exceptions on behalf of the dean

†For the 1993 94 academic year period 2 ends on October 27 for fall semester and on March 30 for spring semester For the 1994 95 academic year period 2 ends on October 26 for fall semester and on March 29 for spring semester

course instructor Permission of the instructor is understood to be an alternate to the stated prerequisites in all courses

It is university policy that the instructor shall inform the students at the beginning of each course if students who have not met the prerequisite requirements must drop the course

Course prerequisites are presented in the *Schedule of Classes* as well as in the *Courses and Programs* section of this catalog

Withdrawal and Reentry

Cancellation of Registration

Students who wish to cancel their registration **must notify the Office of the Registrar before the first day of classes to avoid tuition assessment** Beginning the first day of classes students must formally withdraw from the university to terminate their registration Tuition adjustments are made for withdrawals of registration according to the following schedule

Withdrawal Date	Student Pays
First week of classes	10%
Second week of classes	25%
Third week of classes	50%
Fourth week of classes	75%
After fourth week	100%

Refund schedule for first time enrolled recipients of Title IV financial aid will be calculated in accordance with PL 102-325 the Higher Education Amendments of 1992

Students may cancel their registration by writing to the Office of the Registrar 10 Alumni Hall by going to that office in person or by calling 515-294-1889 Students who call should request the name of the person taking the call and make a record of the name as well as the time and date called A letter of confirmation will be sent after notification is received by the Office of the Registrar

To appeal the tuition adjustment students receive they should contact the fees section of the Office of the Registrar Cases will be considered based on extenuating circumstances beyond the control of students To appeal the decision of the Office of the Registrar, students must make their request for appeal within 10 calendar days after receiving the decision of the Office of the Registrar Their appeal will then be reviewed by the Tuition Appeals Review Committee Students who wish to appeal the decision of the Tuition Appeals Review Committee may make a request to do so in writing to the Office of the Provost

Student-Initiated Withdrawal

Should it become necessary to leave the university before the end of a term students should follow the procedures described in this section Otherwise students records may be adversely affected and reentry or transfer to another institution may be difficult

Students who are considering withdrawal from school should first consult their academic adviser who may be able to suggest alternatives that will be more advantageous If that s not possible students should take care to notify their adviser at the earliest opportunity

A request for withdrawal during period 3 after the last day to drop a course under the most unusual circumstances will not be approved except for circumstances that are beyond the student s control Such requests must be approved by the dean* of the student s college Students should not expect to withdraw during or after the final examination week In a situation beyond a student s control when examinations cannot be completed arrangements should be made for incompletes rather than withdrawal during final exam week Students who are on temporary enrollment and withdraw during period 3—i e , after the last day to drop a course except under the most unusual circumstances—will not be permitted to enroll the following term except under extenuating circumstances

To withdraw from the university, students should

1 Complete a Request for Withdrawal form and have their adviser sign it

2 Request the approval and obtain the signature of the dean of the college in which they are enrolled If the dean approves the withdrawal form will be forwarded to the Office of the Registrar where it will be recorded and the information sent to the appropriate offices If students complete the withdrawal procedure the courses they are taking will not be included on their permanent record nor will they be counted as part of their drop allowance Half-semester courses completed prior to withdrawal will be included on their permanent record Incompletes will not be accepted for withdrawals

If these procedures for withdrawing from the university are not followed, the instructors of the courses involved will assign whatever grades or marks they consider appropriate Since these grades may be F s students are warned that failure to follow the prescribed withdrawal procedures may adversely affect a later application for reentry or transfer to another institution

University-Initiated Withdrawal

In addition to the above procedures exceptional circumstances may arise in which the university may initiate the withdrawal of a student These include

1 Extreme medical situations where the student is hospitalized and/or otherwise unable to implement the withdrawal process Withdrawal is usually initiated by the academic adviser or the office of the college dean

2 Behavioral situations where it is determined that the student should not remain at the university due to behavior that demonstrates that the student is a clear and present danger to self or others In these circumstances it is the duty of the university to take responsible action for the good of the student and/or others in the university community

Determination of the existence of exceptional circumstances that justify university-initiated withdrawal of a student for behavioral reasons will be made by the dean of students the director of the Student Counseling Service the director of the Student Health Center (or their designated agents) and appropriate academic representative in consultation with the student if possible These persons may receive and/or solicit information professional evaluation etc concerning the student s status In the event that they concur that the student should leave the university the student (and in appropriate situations, next of kin) is to be informed in writing of the decision with recommendations concerning treatment or therapy and the conditions required for consideration for readmission This letter will be sent by the dean of students who will also coordinate the review by the same panel

When the decision has been made to withdraw a student the student s adviser will be notified and requested to process the withdrawal form The Dean of Students Office will place a hold on the student s

records to prevent registration until a readmission decision has been reached by the behavioral review team

Refund of Room and Board Fees

Refund of the unused portion of the contract is based on the daily rate of the remaining room and board fee If fees have been paid a refund will be authorized If fees have not been paid a charge will be made for the used portion of the contract A refund is not authorized for any student leaving the residence halls after December 1 in fall semester or May 1 in spring semester

Any student living off campus who has contracted for the meal plan to eat in a residence hall dining room and later terminates the contract will be refunded the same as above

Reentry

Undergraduate and special students planning to return to Iowa State University after an absence of at least one full semester (excluding summer) must complete a reentry application available from the Office of Admissions departmental offices or college classification offices The reentry application should be completed and returned to the Office of Admissions prior to the touch-tone registration period of the semester preceding the term for which reentry is desired Students who have attended another college or university since their last enrollment at Iowa State must have official transcript(s) of all coursework attempted sent to the Office of Admissions

Reentering students should contact their academic adviser or departmental office to select courses and begin registration procedures Reentering students are encouraged to register during the touch-tone registration period They will be assigned registration start dates according to their year-in-school classification based on the same general guidelines as those applied to currently enrolled students Since courses begin to fill on the first day of touch tone registration it will be to a student s advantage to register as early as the start date allows

Generally a request to reenter Iowa State will be approved within the Office of Admissions However the Office of Admissions will refer the reentry application to the college to which the student plans to return if the student (1) desires to change curricula (2) has a previous Iowa State University cumulative grade point average below 2 00 or had a last-term average below 2 00 (3) was dropped from the university for unsatisfactory academic progress or was not otherwise in good standing (refer to reinstatement policy on page 44) (4) since leaving Iowa State has completed additional college study with less than a 2 00 grade-point average or (5) wishes to return as a special student

Students who were academically dropped must submit (1) a reentry application to the Office of Admissions and (2) a petition for reinstatement to their college office at least 45 days before the beginning of the term for which they wish to reenter (Students dropped for the second time and requesting reinstatement in the College of Liberal Arts and Sciences must submit their petition 70 days before the beginning of the term) See reinstatement policy on page 44

Reentering graduate students do not need to complete a reentry application, but they should contact their major professor to select courses and begin registration procedures In most cases reentering graduate students will also need to contact the Registrar s Student Scheduling Office to obtain their registration access information It will be to a student's advantage to register as early as the registration start date allows

Academic Regulations

Class Attendance

Students are expected to attend all class meetings as scheduled Each instructor sets his or her own policy with respect to class attendance and excuses for absence from class are handled between students and the instructor The instructor is expected to announce his or her policy at the beginning of the course Please see section titled *Validation of Enrollment* on page 36 for regulations concerning attendance to validate students enrollment in a class

Veteran Attendance

Students receiving benefits from the Veterans Administration are identified on class lists and are required by the V A to attend class regularly to maintain their V A eligibility If the instructor knows that a student receiving V A benefits is not attending class the instructor is obligated to notify the Office of the Registrar and a notification will be forwarded to the Veterans Administration

Field Trips

Trips away from campus are sometimes arranged as a means of enriching the students learning experience in a given course Such trips may not take place during the first or last week of the semester nor may they extend over more than two consecutive class days (Monday through Friday) these regulations may be waived only by special permission of the dean* of the college in which the course is offered In order to go on a field trip students must first obtain permission from the instructors whose classes they will miss If permission to miss class is not granted students cannot be required to go on the field trip nor can they be penalized for missing the trip Special fees are often charged to cover the costs of field trips Field trip fees are noted in the course description elsewhere in this catalog and in the *Schedule of Classes*

Credit Involving a Paid Activity

Students may obtain credit for an activity either on- or off-campus for which they are also paid provided the activity is academically relevant In order for an activity to be defined as academically relevant prior arrangements for receiving credit must be made with a faculty member in an appropriate department and must include agreement on (1) the academic objectives which the activity is expected to achieve and (2) the procedure by which the student s learning will be assessed This policy does not apply to registrations for R credit

*Students should check with their college office to find out who is authorized to grant approvals or exceptions on behalf of the dean

Academic Dishonesty

Academic dishonesty occurs when a student uses or attempts to use unauthorized information in the taking of an exam or submits as his or her own work themes reports drawings laboratory notes or other products prepared by another person or knowingly assists another student in such acts Such behavior is abhorrent to the university and students found guilty of academic dishonesty face suspension conduct probation or reprimand Instances of academic dishonesty ultimately affect all students and the entire university community by degrading the value of diplomas when some are obtained dishonestly and by lowering the grades of students working honestly

Examples of specific acts of academic dishonesty include but are not limited to

Obtaining unauthorized information Information is obtained dishonestly for example by copying graded homework assignments from another student by working with another student on a take-home test or homework when not specifically permitted to do so by the instructor or by looking at one s notes or other written work during an examination when not specifically permitted to do so

Tendering of information Students may not give or sell their work to another person who plans to submit it as his or her own This includes giving their work to another student to be copied giving someone answers to exam questions during the exam taking an exam and discussing its contents with students who will be taking the same exam or giving or selling a term paper to another student

Misrepresentation Students misrepresent their work by handing in the work of someone else for example by purchasing a paper from a term paper service by reproducing another person s paper (even with modifications) and submitting it as their own by having another student do their computer program or by having someone else take an exam for them

Bribery Offering money or any item or service to a faculty member or any other person to gain academic advantage for oneself or another is dishonest

Plagiarism Unacknowledged use of the information ideas or phrasing of other writers is an offense comparable with theft and fraud and it is so recognized by the copyright and patent laws Literary offenses of this kind are known as *plagiarism*

One is guilty of plagiarism when one *quotes* the exact words of another writer without using quotation marks and indicating the source of the words when one *summarizes* or *paraphrases* the words of another writer without giving the credit that is due or when one borrows ideas from another writer without properly documenting their source Acknowledging the sources of borrowed material is a simple straightforward procedure that will strengthen the paper and assure the integrity of the writer The *English 104-105 Student Manual* from which the definition in the previous paragraph is taken provides guidelines to aid students in documenting material borrowed from other sources as does almost every handbook in writing style

Academic dishonesty is considered to be a violation of the behavior expected of a student in an academic setting as well as a student conduct violation A student found guilty of academic dishonesty is therefore subject to appropriate academic penalty to be determined by the instructor of the course, as well as to penalty under the university student conduct regulations

If an instructor believes that a student has behaved dishonestly in a course, these steps are to be followed

1 The instructor should confront the student with the charge of dishonesty and arrange a meeting with the student to discuss the charge and to hear the student s explanation

2 **If the student admits guilt,** the instructor shall inform the student (a) of the grade on the work in which the dishonesty occurred and (b) how this incident will affect subsequent evaluation and the final grade Because academic dishonesty is also a student conduct violation the instructor shall report the incident in writing to the dean of students The latter or his/her designee will meet with the student and depending on the severity of the offense as well as on the student s past conduct record may schedule a hearing before the All-University Judiciary Committee This hearing conducted according to the procedures outlined in the *Student Information Handbook* is to determine the disciplinary action to be taken In any case the student s academic adviser will be informed of the incident but may not insert any record of it in the student s academic file

3 **If the student claims to be innocent** of the charge the instructor may not assign the student a grade for the work in question until the question of guilt is resolved unless circumstances require that an interim grade be assigned The instructor shall consult with his or her department chair and report the incident in writing to the dean of students The latter will schedule a hearing before the All-University Judiciary Committee to be conducted according to the procedures outlined in the *Student Information Handbook* Both the student and instructor will be invited to attend the hearing and present pertinent information If the student concurs his or her academic adviser will be informed of the charge If the Judiciary Committee finds the student guilty of the charge the instructor will inform the student (a) of the grade on the work in which the dishonesty occurred and (b) how this incident will affect subsequent evaluation and the final grade The Judiciary Committee will determine the appropriate disciplinary action with respect to the student conduct violation If the Judiciary Committee finds the student not guilty the instructor will grade the student accordingly on the work in question and the student's grade in the course will not be adversely affected If the student is found guilty the student s adviser will be informed of the decision but shall not insert any record of the action in the student s academic file

4 If a student either admits dishonest behavior or is found guilty of academic dishonesty by the All-University Judiciary Committee the committee may impose any of the following sanctions

Disciplinary Reprimand—An official written notice to the student that his/her conduct is in violation of university rules and regulations

Conduct Probation—A more severe sanction than a disciplinary reprimand to include a period of review and observation during which the student must demonstrate the ability to comply with university rules regulations and other requirements stipulated for the probation period

Suspension Deferred—The suspension is deferred subject to a definite or indefinite period of observation and review If a student is found guilty of further violation of the University Code of Conduct or an order of a judiciary body suspension will take place immediately

Defined Length—The student is dropped from the university for a specific length of time This suspension cannot be for less than the remainder of the semester in progress or for the next full semester

Indefinite—The student is dropped from the university indefinitely To be reinstated the student must appear at a hearing conducted by the All-University Judiciary Committee which makes the reinstatement decision Reinstatement may be contingent upon meeting written requirements specified by the All University Judiciary Committee at the time of the reinstatement hearing

5 A student accused of cheating has the option to stay in the class or to drop the class if the drop is made within the approved time periods and according to the regulations established by the university If the student chooses to drop the class the student will be required to sign a statement of understanding that if the student is later found guilty of cheating then the student will receive an F for the course

6 Procedures for appeal of either the All-University Judiciary Committee s conduct decision or the instructor s grade are outlined in the *Student Information Handbook*

7 In instances in which the student admits guilt or is judged to be guilty by the Judiciary Committee a staff member of the Dean of Students Office will counsel with the student in an effort to deter any further such incidents

8 Student records concerning academic dishonesty are maintained in the Dean of Students Office for a period of four years after which the file records are purged These student records are confidential nothing from them appears on a student s academic transcript

9 In the event that an instructor is uncertain how to handle an incident of suspected academic dishonesty the dean of students is available at any time to provide advice and assistance to the instructor in deciding a proper course of action to be taken

10 Students enrolled in the College of Veterinary Medicine are bound by an honor code A charge of academic dishonesty may be made by a student or instructor to the Interclass Honor Board chairperson according to the procedures outlined in the Honor Code or the instructor may follow the procedures outlined above The Interclass Honor Board functions as the judiciary of the College of Veterinary Medicine for all allegations presented to it

Progressing Toward a Degree

Classification

One indication that a student is making progress toward a degree is the change in her or his classification as a student Classification is determined by the number of credits completed and reported to the registrar prior to the beginning of the term and is based on credit hours earned not merely hours attempted The grades of F and NP and the marks of I and X do not count in this classification system

Classification in all colleges except Veterinary Medicine is uniform

Sophomore classification—30 credit hours earned
Junior classification—60 credit hours earned
Senior classification—90 credit hours earned

Students who have a bachelor s degree and are working toward another undergraduate degree or certificate or admission to a specific graduate or professional program may be classified as a senior

Transfer students without a degree are classified on the basis of credits accepted by Iowa State

A student who is attending Iowa State but does not wish to work toward an undergraduate degree or certificate will be classified as a **special student** Admission requirements and academic standards regulations are the same as for regular students Credits taken as a special student are applicable for undergraduate degree purposes if the student is later admitted as a regular undergraduate Credits obtained as a special student may not however be applied toward a graduate degree Students enrolled in the Intensive English and Orientation Program (IEOP) are classified as special students in the College of Liberal Arts and Sciences and usually are not permitted to enroll in academic courses until they have satisfied requirements for admission as regular students Permission to enroll in one academic course may be granted under special circumstances

Promotion of veterinary medicine students from the first- to the second- third- and fourth-year classes is based upon satisfactory completion of the required courses for each year To be promoted to the second-year class students must have a cumulative grade-point average of at least 1 67 for all courses in the first year of the veterinary medicine curriculum To be promoted to the third- and fourth-year classes students must have a cumulative grade point average of at least 2 00 for all courses in the professional curriculum

Transfer of Credits

Credits presented from another institution are evaluated initially by the Office of Admissions to determine whether the courses in which they were earned are acceptable for transfer credit The application of those credits toward

a degree will be determined by the student s college based on their relevance to the requirements of her or his program as well as the level of performance deemed necessary for successful progress in that program Thus as is true for students already enrolled at Iowa State courses that are deemed important to a program but in which credits were earned with less than a C grade may or may not be approved for application in a program Grades earned in courses transferred to Iowa State University will not be used in calculating a transfer student s Iowa State cumulative grade point average

A student who is admitted as a transfer from another college or university is required to have at least a 2 00 cumulative grade-point average for all transferable work taken elsewhere If due to special circumstances a student is admitted with less than a 2 00 average that student has a transfer quality-point deficiency This deficiency will be added to any deficiency accumulated at Iowa State University and will be used to determine whether satisfactory progress toward a degree is being made (See page 39) To graduate students must earn sufficient quality points above a 2 00 at Iowa State to offset any deficiency at time of entrance

Students should consult with their academic advisers before taking coursework at other colleges and universities to be certain it will be applicable to their program of study Students who believe that any transfer credits have not been correctly evaluated should consult with their academic adviser and with the Office of Admissions Questions concerning the application of transfer credits to the degree program should be referred to the academic adviser and college office

When the total number of semester credit hours accumulated at all institutions attended exceeds 65 credits from a two-year college will not reduce the minimum number of credit hours required for a baccalaureate degree If a student s adviser and department head believe that special circumstances justify waiving this restriction approval must be obtained from the dean of appropriate college prior to enrollment in the two-year college course

Iowa State University students who attend one of the other Iowa Regent universities under the Regent Universities Student Exchange Program will have the credits earned at the other university counted as resident credit and grades received included in their Iowa State University cumulative grade point average See *Index* for information on applying to the Regent Universities Student Exchange Program

Degree Planning

In addition to being properly registered students are responsible for knowing the requirements for the degree they hope to obtain and for planning their schedule to meet those requirements Each college has a procedure to determine whether a student will fulfill all degree requirements for graduation

Each fall and spring semester students receive an advisement/degree audit printout at the time of registration This printout shows in a degree program format those courses that have been completed and those courses in which the student is currently enrolled Also shown are the graduation requirements that have not been completed

Students should use the information on this printout to help them select courses for the next term and to evaluate their progress toward their degree If students have questions about how courses they have completed fulfill degree requirements or how courses they plan to take will apply to their degree requirements they should discuss these questions with their adviser During the term students graduate a printout of this type will be used by the graduation evaluators in the Office of the Registrar to evaluate their graduation status

Two Bachelor's Degrees

Students may receive two bachelor s degrees if the requirements for each major (curriculum) are met and the total number of semester credits earned is at least 30 more than the requirements of the curriculum requiring the greater number of credits The same rule applies to degrees that are not awarded at the same time Students should have an academic adviser in each major (curriculum) with one adviser being designated as the registration adviser Students should request approval to pursue two degrees by completing the form Request for Double Major/Curriculum or Two Degrees This form is available from advisers and classification offices Each adviser will receive grade reports and schedule information after this form has been processed Each degree program must be approved by the appropriate department and college

Double Major/Curriculum

A double major is a program for a single degree in which all requirements for two or more majors (curricula) have been met The majors (curricula) may be in different colleges or within the same college or department The diploma and permanent record will designate all majors (curricula) that are completed at the same time

Declaration of a double major (curriculum) should be made by completing the form Request for a Double Major/Curriculum or Two Degrees This form available from advisers and classification offices should be completed no later than the beginning of the senior year One major (curriculum) should be designated as *primary* and the other *secondary* for purposes of record keeping but the student s rights and responsibilities are the same in both majors The adviser of the primary major will serve as the student s registration adviser but both advisers will receive grade reports and schedule information Degree programs must be approved for each major (curriculum) by the appropriate department and college One of the majors may subsequently be canceled using the same form

In addition to their engineering degree students in the College of Engineering may earn majors in other colleges of the university A major must meet all requirements of the offering department or program and its college and contain a minimum of 15 additional credits beyond the requirements for a B S degree in engineering for each major area of study Within the College of Engineering only double degrees are permitted

Students with a primary major in another college who wish to take a second major in the College of Liberal Arts and Sciences are not required to meet the Liberal Arts and Sciences General Education requirements They must however meet all requirements for the major including support courses Students in the B L S curriculum in the College of Liberal Arts and Sciences do not declare a major

Second Major (Curriculum) Completed After the Bachelor's Degree

After receiving a bachelor s degree a person may wish to complete all requirements for another major (curriculum) Approval of the department the second major (curriculum) is needed before study for the program is begun At the completion of the program a notation will be made on the permanent record (transcript) but no change will be made on the diploma received at the time of graduation A degree program must be approved for the second major/curriculum by the department and by the dean s office

Changing Curriculum or Major

A student s freedom to change her or his major and the procedure that should be followed depend on the student s academic standing as well as on policies of individual colleges as approved by the provost

1 If students are not on temporary enrollment and have never been dismissed and reinstated they may change their major by consulting first with their adviser (If however they have been on temporary enrollment in the past they may also be subject to regulation 4, below) Beyond that they should follow these procedures

a If the change involves majors within the same college they should check with the college office to obtain instructions as to how to make the change

b If the change involves majors in different colleges they should obtain a Change of Curriculum/Major form and their file from their adviser present these materials to the classification office of their present college then to the classification office of the college to which they are transferring and finally to the office of their new major

2 If they are on temporary enrollment students must first obtain permission to enter the new major from the dean of the college responsible for that major in consultation with the department head If they receive permission they should then follow the procedures described above If they are on temporary enrollment and want to transfer to another college in the university they must do so before the last day to drop a course in period 2 (see page 44)

3 If they have been reinstated they may not transfer to another college during the first term following reinstatement and they may not at any time transfer back to the college that originally dismissed them without the permission of the academic standards committee of that college

4 If they transferred from one college to another while on temporary enrollment they may not transfer back unless they have the permission of the academic standards committee of the college from which they originally transferred

Declaring a Minor

Requirements for an undergraduate minor are specified by many departments and programs in the university a record of completion of such requirements appears on students transcripts All minors require at least 15 credits including at least 6 credits in courses numbered 300 or above taken at Iowa State The minor must include at least 9 credits that are not used to meet any other department college or university requirement For additional information regarding policies which govern minors see page 52 To declare a minor students must submit a completed Request for a Minor form to their college office at least one term before graduation The minor may be from the catalog the student is graduating under or a later catalog

Graduation

Graduation ceremonies are held at the end of each semester and at the end of the summer session Students must contact the graduation evaluator s office Room 10A Alumni Hall early in the term they plan to graduate to complete the final check of their degree program and fill out their diploma order card Dates to sign up for an appointment for the final degree check are published in the *Iowa State Daily* and are posted on departmental bulletin boards All candidates for graduation must be formally approved by the faculty

Students are not required to attend the graduation ceremony If they want to graduate without attending the ceremony they should inform the graduation evaluator at the beginning of the term complete a diploma card and provide an address to which their diploma is to be mailed

In order to graduate, students must be sure that

1 Registration for the term has been completed and their date of graduation is correct on their advisement/degree audit printout

2 They will have earned sufficient credits acceptable toward graduation to meet the minimum requirements for their curriculum (Some examples of credit not acceptable toward graduation are elective credits beyond those allowed in a curriculum credits earned in passing the same course more than once more than four credits of Athletics 101 and credit in two courses for which the catalog states that only one may count toward graduation)

3 They have been certified by their major department as having achieved an adequate level of proficiency in written communication

4 They have attained a cumulative grade point average of at least 2 00 in all work taken at Iowa State and have also met any special grade point averages required by their college department or program in specified groups of courses

a If they were admitted from another college or university with a quality-point deficiency they must have earned sufficient quality points above a 2 00 at Iowa State to offset the deficiency with which they entered

b If they have taken work at another college or university after having been a student at Iowa State they must have submitted a transcript of all such college study attempted to the Office of Admissions This work must average 2 00 or the deficiency of quality points will be assessed against them Failure to submit such a transcript is grounds for dismissal

c If they fail to meet the 2 00 requirement but have satisfactorily completed all other requirements for the degree their college academic standards committee may review their record to determine whether their educational and professional needs have been satisfactorily met or can satisfactorily be met by imposing further conditions The committee may recommend to the dean of their college that they be graduated or that a supplemental program be accepted in place of the grade point average alone The chair of the college academic standards committee shall report such exceptional action to the Faculty Senate Academic Standards and Admissions Committee

5 Incompletes in courses required for graduation have been removed by midterm of the term of graduation

6 At least 32 credits have been earned in residence at Iowa State University and the final 32 credits were taken at Iowa State (Six of the last 32 credits may be transferred to Iowa State with prior written permission of their major department if earned at a four-year college) A transcript of their transfer work must be received by Iowa State by midterm of the term of graduation

7 They have paid all outstanding financial obligations they owe the university If they owe an outstanding obligation to the university a hold will be placed on their graduation until the outstanding obligation has been cleared All outstanding obligations must be cleared within six months of the graduation date or their graduation will be voided If students have any questions about this policy they should contact the graduation section of the Office of the Registrar 10A Alumni Hall

8 They have processed a graduation approval slip which gives tentative final clearance for graduation by university offices and instructors of courses in which they are currently enrolled Instructors and offices may cancel their approval for graduation until 5 p m the day before graduation by contacting the graduation evaluators in 10A Alumni Hall

An information sheet giving the dates for processing the approval slip will be available from the graduation evaluator during the final check at the beginning of the term

9 The graduation section of the Office of the Registrar has been notified by the midterm of the semester or the middle of the summer session of their intent to graduate that term

Evaluation of Academic Progress

Evaluation Procedures

It is university policy that the instructor shall inform the students at the beginning of each course of the evaluation procedures planned for use in the course

Retention of Records

Records of all graded work must be retained by the instructors until midterm of the semester following completion of a course or

until all pending appeals and incompletes are resolved whichever is later Instructors leaving the university must file test and grade records with their department office before departure

Examinations

Examinations are one of the major means by which an instructor assesses students performance in a course In order that examinations can be a useful part of the educational process the following policies have been instituted

1 One purpose of examinations is to help students learning activity Therefore examinations shall be evaluated as soon as possible after they are given and the results shall be made available to the students

2 All tests and examinations administered between the beginning of the term and final examination week shall be held during a regularly scheduled lecture or laboratory class period for that course A department may request permission to administer a separately scheduled examination if all of the following criteria are met (a) the course is multi-sectioned (b) a common departmentally developed examination will be administered to all students in all sections at the same time and (c) the test scores will be used as a basis for a uniform grading procedure for all sections of the course Requests to hold separately scheduled examinations must be made to the registrar and approved by the provost in time to be announced in the *Schedule of Classes* Whenever a separately scheduled examination is administered a regular class meeting during that week shall be omitted Students who are unable to take a separately scheduled examination at the scheduled time because of a course conflict or other legitimate reason must notify the instructor in advance and must be given the opportunity to be examined at another time mutually convenient for the student and the instructor the instructor shall determine whether to administer the same examination or an alternate examination or use an alternate assessment procedure

3 At the end of the semester a week is set aside for **final examinations** or other term evaluations with a period normally of two hours scheduled for each course The following policies govern the responsibilities of students and faculty members during this week

a **Final exams** in courses of two or more credits may not be given at a time other than that for which the exam is scheduled by the registrar **An instructor may not give a final exam prior to final exam week nor change the time of offering of the final examination as it appears in the final exam schedule** Permission to change the time for which an exam is scheduled may be given only by the dean of the college If the instructor elects not to give a final exam the class is required to meet at the scheduled final exam period for other educational activity such as a review of the course or feedback on previous exams

b Final exam periods are determined according to the regularly scheduled meeting time of the class However certain courses are assigned special group exam times so

that several sections of the same course may be tested together If this results in conflicting group examination periods students should inform the instructor in charge of the first of the two conflicting courses as listed within the special groups in question that instructor is responsible for arranging a special examination or making some other adjustment

c The final exam for a class that regularly meets in the evening must be held at the time the class would normally meet during the final exam week If this exam conflicts with an evening group exam the instructor responsible for the latter must arrange a special examination for any students who have a conflict

d If unusual circumstances involve the need for students to change the time of their final examination they must obtain the approval of the instructor of the course

e If a student has **three** examinations scheduled on the same calendar day and wishes to change one to another day the instructor of the course having the smallest number of students is responsible for arranging an alternate examination time for the student unless make-up exam times are available in one of the other courses

f All faculty members are considered to be on duty throughout the entire final examination week and are expected to be available to students during that week for discussion of any matters pertaining to the final examination and final grade or to other aspects of the course

g **Dead Week** The last week of classes has been designated Dead Week by the Government of the Student Body The intent is to provide students with time for review and preparation for final examinations Therefore no activities sponsored by student organizations under the jurisdiction of GSB may be held during that week For academic programs however the last week of classes is considered to be a normal week in the semester Instructors are reminded that most students are enrolled in several courses each semester and their workloads often increase as final examination week approaches Instructors are encouraged to give major assignments and examinations prior to the last week of classes so students can budget their time better for final examination preparation

The Grading System

Grades represent the permanent official record of a student s academic performance The grading system at Iowa State operates according to the following regulations

1 Student performance or status is recorded by the grades and marks described below A student s grade point average is calculated on the basis of credits earned at Iowa State with the grades and quality points shown below Credits earned with P S or T are not used in calculating the grade point average but may be applied toward meeting degree requirements **A cumulative grade point average of 2 00 is required for a bachelor's degree**

Grades	Quality Points
A	4 00
A–	3 67
B+	3 33
B	3 00
B–	2 67
C+	2 33
C	2 00
C–	1 67
D+	1 33
D	1 00
D–	0 67
F	0 00

P—Passing mark obtained under the Pass-Not Pass system See page 47 for details about the Pass-Not Pass system

NP—Non passing mark obtained under the Pass-Not Pass system See page 47 for details about the Pass-Not Pass system

S—Satisfactory completion of a course offered on a Satisfactory-Fail grading basis May also be reported to indicate satisfactory performance in R (non-credit) courses and in courses numbered 290 490 590 and 690

T—Satisfactory performance (equivalent to a grade of C or better) in a special examination for academic credit

X—The course was officially dropped by the student after the first week of the term

N—No report was submitted by the instructor This is not a recognized grade or mark It merely indicates the instructor has not submitted a grade and that a grade report has been requested

I—Incomplete An incomplete mark may be assigned when the student is passing at the time of the request but special circumstances behond the student s control prevent completion of the course In general **failing the final exam or project or not submitting course work as a result of inadequate preparation or learning are not valid excuses**

The student and instructor must complete and sign an incomplete contract (Incomplete Mark Report form) that states the reason for the I the requirements for resolving it and the date by which it must be resolved not to exceed one calendar year The instructor then enters an I on the final grade report attaches the form to the report and submits both to the registrar

If the student is not available at the end of the term to sign the Incomplete Mark Report form because of ill health or other reasons the instructor may assign an incomplete mark and submit the form without the student s signature The Office of the Registrar will record the incomplete mark and will mail a copy of the form to the student If the student chooses not to accept the incomplete the student has until midterm of the following semester to contact his or her instructor and request a grade be submitted to the registrar If the student has not contacted the instructor by midterm the student must resolve the incomplete according to the conditions set forth in the Incomplete Mark Report form

When a student completes the requirements specified on the Incomple Mark Report form the instructor submits the appropriate grade which becomes part of the student s cumulative but not term grade-point average

A final course grade once submitted to the registrar may not be changed to an Incomplete except to correct an error at the request of the instructor and with the approval of the instructor s department head and the dean of the instructor s college The instructor should send a card (Grade Report to the Registrar) reporting the change and an Incomplete Mark Report form to the appropriate dean who will forward them to the registrar if the change is approved

Incompletes in all courses must be resolved by the middle of the student s term of graduation Repeating a course will not resolve an I mark A mark of I will automatically change to a grade of F after one calendar year (whether or not the student was enrolled during the period)

2 To change a grade or mark already reported to the registrar the instructor submits a change card (Grade Report to the Registrar) This card is used for replacing an I with a grade for correcting an instructor error or for the late report of a grade

3 The registrar will transmit notification of C- D and F midterm grades and incorrect registrations to advisers and will also attempt to notify students of midterm grades and incorrect registration In addition to returning the midterm list the instructor is responsible for informing the class of the basis on which midterm grades have been submitted

4 Grades in all courses attempted remain on each student s record If a course is repeated the record will show the grade obtained on the initial attempt as well as grades received on subsequent attempts

5 The cumulative grade point average is calculated by dividing the total number of quality points earned by the total number of credits in all courses attempted Grades of S P NP and T are not counted in calculating the grade point average If a course is repeated the cumulative grade point average is calculated according to the process described in item 6a below

6 Repeating Courses

a The most recent grade for a course a student **repeats** will be used in computing the student s cumulative grade point average rather than the previous grade(s) up to a limit of 15 credits (This could result in a lowered grade point average if the second grade is lower than the first or even loss of credit if the grade is lowered to an F) All grades will remain on the student s record

b Students may repeat any course for which an F grade or any passing grade except P or S was received but they may not elect to repeat the course under the Pass-Not Pass system

c Beyond 15 credits of repeats both grades will be included in computing the cumulative grade point average

d Courses should be repeated as soon as possible preferably within three semesters in residence because of changes that occur with course updating change in course number or revision in number of credits Approval to repeat a course after more than three semesters have elapsed must be noted on a Designation of Repeated Course form which can be obtained from departmental offices This form must be signed by the head of the department offering the course and by the student s adviser and then taken to the Office of the Registrar This form must also be used in cases in which the course number or number of credits has changed Deadlines for filing repeated course forms for full semester and half-semester courses are published in the University Calendar

e Transfer students may repeat courses at Iowa State University for which a D or F was received at another institution They must process a designated repeat form indicating they are repeating the course to reduce a transfer deficiency Such repeated credits will count toward the 15-credit request limit and will affect only their transfer deficiency

f A student who has earned an F at Iowa State University may repeat the course at another institution and the credits earned may be applied toward graduation at Iowa State but the grade earned will not be used in computing a cumulative grade point average

7 Students who want to protest a grade submitted by an instructor should follow the procedures described in the section on *Appeal of Academic Grievances* on page 47

Academic Progress

Each college has an academic standards committee that is responsible for monitoring the academic progress of all undergraduate students in that college based on policies and minimum requirements set by the Faculty Senate Committee on Academic Standards and Admissions and ratified by the Faculty Senate Individual college faculties may with the approval of the Faculty Senate Committee on Academic Standards and Admissions set additional requirements that are not lower than those established for the university These additional requirements must be reviewed at least every third catalog by the college academic standards committee to determine if they should be continued Subsequent action by the university committee is required only when the additional requirements differ from those already approved The college committees are responsible for actions involving individual students with respect to placing students on temporary enrollment dismissing students from the university for unsatisfactory academic progress and reinstating students who have been dismissed For questions concerning interpretation and application of the rules governing academic progress students should contact the chair or secretary of their college academic standards committee in the administrative office of their college

The university s academic standards rules are presented below In addition to taking action based on these rules a college academic standards committee may also place a student on temporary enrollment or dismiss a student from enrollment in the university when in the college committee s judgment the student s academic performance or progress toward a degree is exceptionally deficient Likewise a college committee may under exceptional circumstances exempt individual students from the application of these rules

Students who participate in the Regent Universities Student Exchange Program or in a similar program where the credit taken at the other school will be considered as resident credit and the grades included in the student s ISU cumulative grade point average are subject to Iowa State University s academic standards

Temporary Enrollment Status and Academic Dismissal

Students are placed on temporary enrollment status as a warning that their academic progress is not satisfactory and that they must improve their academic performance to avoid dismissal from the university Students who are placed on temporary enrollment should immediately seek assistance in academic improvement from such sources as academic advisers instructors the Student Counseling Service and the University Tutoring Office

Students may be admitted to Iowa State University on temporary enrollment or may subsequently be placed on temporary enrollment as a result of unsatisfactory academic performance Students on temporary enrollment status who do not meet the minimum requirements described below will be dismissed from enrollment in the university

Decisions regarding temporary enrollment and academic dismissal are based on the student s cumulative quality-point deficiency The number of deficient quality-points is determined by subtracting the total number of ISU quality-points from twice the number of ISU credits attempted * If a student enters Iowa State University with a quality-point deficiency this deficiency will be added to any deficiency accumulated at Iowa State University to determine the cumulative quality-point deficiency

Example Assume a student has attempted 65 credit hours of coursework and has a cumulative grade-point average of 1 80 This student needs 130 quality points (i e 65 credit hours x 2 00 points) in order to have zero quality-point deficiency The student currently has earned 117 quality points (i e 65 credit hours x 1 80 grade point average**) Thus the student currently is deficient by 13 quality points (i e 130–117)

Assume the student must remove this 13 quality-point deficiency over the next 30 credit hours The student would need to earn 73 quality points (i e 30 credit hours x 2 00 quality points = 60 quality points) in order to not add to the deficiency Thus a grade-point average of 2 44 (i e 73 quality points/30 credit hours) for the next 30 credit hours is needed to remove the deficiency

Students who are placed or continued on temporary enrollment at the end of the spring semester may enroll for the summer term without being placed in jeopardy of academic dismissal from the university at the end of that summer term However the cumulative quality-point deficiency at the end of the summer term will be used for temporary enrollment decisions This is true for all students enrolled in the summer term Students considered for academic dismissal at the end of spring semester will be permitted to enroll for the summer term The cumulative quality-point deficiency at the end of the summer term will be used to determine whether the student should be, permitted to continue The individual colleges determine if students reinstated for the spring semester will be permitted to utilize the summer term option (Reinstated students should also see the section on Reinstatement page 44 of this catalog)

a Students with fewer than 90 credits attempted or earned * whichever is greater will be placed on temporary enrollment at the end of any semester or summer term when their cumulative quality-point deficiency equals 10 or more quality points At the end of any term in which a student is on temporary enrollment the student will be

(1) **dismissed from enrollment** in the university if the cumulative quality-point deficiency has increased

(2) **continued on temporary enrollment** if the cumulative quality-point deficiency has not increased but remains 10 or more

(3) **removed from temporary enrollment** if the cumulative quality-point deficiency is now less than 10

b Students with 90 or more credits attempted or earned * whichever is greater will be placed on temporary enrollment at the end of any semester or summer term when they have **any** quality-point deficiency At the end of the term in which a student is on temporary enrollment the student will be

(1) dismissed from enrollment in the university if the cumulative quality-point deficiency has increased

(2) continued on temporary enrollment if the cumulative quality-point deficiency has not increased but remains greater than zero

(3) removed from temporary enrollment if the cumulative quality-point deficiency has been removed

c A student on temporary enrollment may transfer to another college within the university only with the permission of the department executive officer (DEO) of the new department and dean of the new college Transfer during period 3 (after the last day to drop a course) may be approved by the DEO of the new department and dean of the new college only under exceptional circumstances The student will be subject to any additional specific academic requirements determined by the academic standards committee of the college to which the transfer is made

d A student who has transferred from a college while on temporary enrollment cannot transfer back unless permission is granted by the academic standards committee of the original college

e A student on temporary enrollment who withdraws during period 3 will not be permitted to enroll the following term except under extenuating circumstances as judged by the college academic standards committee

Additional Academic Progress Regulations

a Colleges departments or programs may have special grade point requirements for admission continuation or graduation These are presented in connection with statements of college and department curriculum requirements

b **Engineering** In addition to the requirements listed above students enrolled in the College of Engineering with fewer than 60 credits attempted or earned * whichever is greater will be placed on temporary enrollment at the end of any semester when they earn less than a 1 00 grade-point average for that semester Students enrolled in the College of Engineering with 60 or more credits attempted or earned* whichever is greater will be placed on temporary enrollment at the end of any semester when they earn less than a 2 00 grade point average for that semester Students placed on temporary enrollment under provisions of this requirement will be dismissed from enrollment in the university if they fail to achieve for the following semester at least a 1 00 semester grade point average if the total credits at the end of that semester are fewer than 60 or at least a 2 00 semester grade point average if the total credits at the end of that semester are 60 or more

Summer term grades will be combined with the student s grades for the prior term completed to form a single semester grade point average to be used for temporary enrollment and academic dismissal decisions Credit hours and quality points will be combined for the purpose of obtaining the average When courses are repeated both grades will be used in this computation

Students considered for academic dismissal at the end of a spring semester under provisions of the preceding paragraphs will be permitted to enroll for the following summer session

c **Veterinary Medicine** Additional rules for minimum satisfactory progress are in effect

d **Special students** Students matriculated in this classification category are governed by the regular academic progress regulations Furthermore by special action of their college academic standards committee additional standards may be required

Reinstatement

The procedures delineated in this section apply to students who were dismissed from Iowa State for academic reasons Students who left Iowa State in good academic standing and who are seeking reentry should see the section titled Reentry on page 38 for details

a Reinstatement is not automatic A student who has been dismissed for academic reasons should contact the Dean's Office in the college he or she wishes to enter for instructions specific to that college The college Academic Standards Committee reviews each petition and other relevant information and reinstatement is based upon that review The student must identify the causes of her or his poor academic performance and demonstrate that he or she

*"Attempted refers to credit hours both passed and failed at Iowa State University earned includes transfer credits and credit hours passed at Iowa State University

**Total quality points can also be determined by summing the quality points associated with each letter grade earned for each of the 65 credit hours completed by the student See page 42 for quality points associated with each letter grade For example assume this student has earned 52 credit hours of C and 13 credit hours of D Total quality points may be determined

52 x 2 00 = 104 00 quality points for C grades
13 x 1 00 = 13 00 quality points for D grades
117 00 total quality points

has taken actions to avoid or eliminate these causes The student must submit a plan for academic success

b A student can only be reinstated when at least one academic semester has elapsed since she or he was academically dismissed The summer session is not a semester for the purpose of being out of school one semester

c A student who has been dismissed from enrollment two or more times is not eligible for reinstatement until at least two academic semesters have elapsed since his or her last academic dismissal

d A student who was dismissed by one college and subsequently reinstated by another college cannot transfer back unless permission is granted by the Academic Standards Committe of the original college This procedure applies regardless of the student s current academic standing

e To be considered for reinstatement to the university a student must file a reentry application and submit a petition to the Academic Standards Committee of the college in which she or he desires to enroll at least 45 days before the beginning of the semester (A student dismissed for the second time and requesting reinstatement in the College of Liberal Arts and Sciences must submit his or her petition 70 days before the beginning of the semester)

f As conditions of reinstatement a student will reenter on temporary enrollment and must accept whatever additional requirements are stipulated by the college Academic Standards Committee Some examples may include full- or part-time status specified credit hours specific courses specific GPAs restriction on choice of major and required counseling Other conditions may also be imposed

Student Appeal

a Students may appeal a decision regarding their academic status if they believe that new information can be provided or extenuating circumstances exist that would alter the application of any rule in this section The appeal should be made in writing to the academic standards committee of the college in which the student is enrolled The written appeal must include the reasons for the appeal and the evidence to substantiate these reasons

The student should initiate the appeal process by contacting the secretary of the college academic standards committee in the administrative office of her or his college immediately upon receipt of notification of the committee s action and no later than the published date for the one-day registration prior to the new term The secretary will then inform the student of the deadline for submission of the written appeal

b If the student is dissatisfied with the committee s action he or she may submit an appeal in writing to the dean of her or his college within seven calendar days The dean must respond in writing within seven calendar days of receipt of the appeal

c If the issue is not resolved within the college further appeals may be made in writing to the provost and subsequently to the president of the university Appeals beyond the college level will however be considered only if based on one or both of the following contentions (a) appropriate procedures were not followed at the college level (b) academic rules were not applied correctly at the college level

Satisfactory Academic Progress for Financial Aid Recipients

In order to remain eligible to receive financial aid from the student aid programs listed below a student must meet both quantitative and qualitative academic standards as described within this policy These standards are minimum expectations specific aid programs may require a higher level of progress A student not in compliance will be unable to receive aid from these programs until the deficiency has been corrected Progress toward a degree will be reviewed each term and enforced at intervals no longer than one year The programs affected by this policy are

Pell Grant
Supplemental Educational Opportunity Grant (SEOG)
Iowa State University Grant
College Work-Study Program (CWSP)
National Direct Student Loan (NDSL)
Health Professions Student Loan (HPSL)
Federally Insured Student Loan (FISL)
Guaranteed Student Loan (FSL)
PLUS Loan
Health Education Assistance Loan (HEAL)
University Long-Term Loan

1 The quality standard is described in the section *Academic Progress* beginning on page 43 All students must meet these standards for continued enrollment in order to remain eligible to receive financial aid

2 The quantity standard for full-time undergraduate students is described below

a Duration of eligibility Students may receive federal and institutional aid for a maximum of six academic years or twelve semesters Students who have not accumulated sufficient credit hours at the end of this time period to complete their course of study will not be eligible to continue to receive financial aid

b Annual credit hours to be earned An undergraduate student who receives financial aid from one or more of the programs cited above must complete credit at a rate at least equal to the scale below where the numbers in the top row indicate academic years completed and those in the bottom row indicate credit hours required

1	2	3	4	5	6
15	30	51	72	96	120

3 The quantity standard for all part-time students

a The duration of eligibility for part-time students is the same as above but adjusted by the rate of attendance For example a student with a maximum duration of six years who is attending school half time would have the duration of eligibility adjusted to twelve years

b Part-time students who are otherwise eligible for financial aid must maintain the academic standards or rate of completion as stated above adjusted by the number of hours attempted at the time the financial aid was disbursed
9 to 11 credit hours = ¾ time
6 to 8 credit hours = ½ time

4 Regaining eligibility If a student is denied financial aid because of failure to comply with the above standards the additionally required

credit must be earned at the student s own expense at Iowa State University or the student must transfer sufficient hours taken at another institution to make up the deficiency

5 Transfer students A student transferring to Iowa State University for the first time will be treated as a first-term student and will not be held responsible for previous terms or credit hours taken at former institutions If a student attends Iowa State transfers to another institution and then transfers back to Iowa State the credits earned at the other institution will be added to the student s total earned credit hours

6 Noncredit courses Noncredit courses may be converted to credit hours by translating weekly contact hours as defined by the Registrar s Office

7 Appeals Students ineligible for financial aid as a result of this policy or ineligible for any other reason may appeal this decision by submitting in writing extenuating circumstances beyond their control that affected their progress to the director of the Student Financial Aid Office and/or the designated representative The appeal may be accompanied by a recommendation from the student s academic adviser If this appeal is denied a further appeal may be made to a committee composed of the chair of the University Financial Aid Committee the chair of the University Academic Advising Committee and the director of Student Financial Aid Appeals of other financial aid decisions including loss of athletic grants-in-aid shall also follow this procedure

8 General Information and Definitions

a **Guaranteed Student Loan/Parent Loans for Undergraduate Students (GSL/PLUS)** Applications will not be processed or checks released for a GSL/PLUS loan for any student who is not in compliance with the minimum standards described in this policy Students should be aware that different state and guarantee agencies may have additional and varied standards that must be met before a loan can be granted

b **Incompletes, repeated courses, withdrawals** A student who receives an Incomplete repeats a course or withdraws may continue to receive financial aid upon reentering the university as long as the student completes the required credit hours for each academic school year and maintains the minimum quality-point standards However the duration of eligibility will not be extended for a student who withdraws or repeats a course (See the section *Duration of Eligibility*)

c **Exceptions to the policy**
(1) **Professional students** For those students enrolled in the College of Veterinary Medicine eligibility will be based on the academic criteria of the college

(2) **Special undergraduate students** These students are eligible for GSL only and must maintain a minimum GPA of 2 00

d **Academic school year** This includes the summer session and regular semesters within any 12-month period Hours earned during the summer session will be included when totaling credit hours earned each academic year

e **Changes in program of study** The duration of eligibility will not be extended for a student who changes from one program of study to another (See the section *Duration of Eligibility*)

These academic progress criteria are defined in **minimal** terms If the student earns only the minimum credit hours for financial aid eligibility the student s total eligibility for particular programs may be exhausted prior to degree completion (See *Duration of Eligibility* and *Credit Hour Earning Scale*) In addition the student s college or department may require more credit hours than required by this policy

Sources of Help with Academic Problems

If students are having trouble in a course here are some persons and places where they may be able to get help

1 **The instructor** of the course may be able to help them determine why they are having difficulty and may suggest how they can improve

2 They should tell **their adviser** that they are having trouble He or she may be able to recommend support services or remedial strategies

3 **The office of the department that offers the course** may have a list of persons qualified to provide tutoring services for the course The locations of the department offices are listed in the front of the *ISU Directory*

4 **The Student Counseling Service** provides professional counseling services for students with problems including academic difficulties Tutoring may be arranged through the University Tutoring Office in the Dean of Students Office

Scholastic Recognition

The university recognizes those students who are doing exceptionally well in several ways

1 **Dean's List** Each semester the university issues a dean s list made up of those students who have carried at least 12 hours of graded or S-F courses with a 3 50 grade-point average or above for the semester Courses taken on a P-NP basis do not count as part of the 12-hour requirement No dean s list is issued for summer school

2 **Scholarship Recognition Dinner** Each spring the university recognizes high scholarship students at the scholarship recognition dinners to which outstanding students and their parents or spouses are invited The dinners honor those undergraduate students who rank in the top 2 percent of each class in all colleges For each curriculum or major the senior student in the current year s graduation class who has attained the highest grade point average is given special recognition Special recognition is also given to the graduating senior in each college with the highest grade point average Students honored at the scholarship recognition dinners must have a grade point average of 3 50 or higher and meet requirements for number of credits completed at the university To be honored in the upper 2 percent category a new or transfer freshman student (or first-year veterinary medicine student) must have earned a minimum of 14 ISU credits with no more than 2 nongraded credits to be counted in this total Transfer students entering at the sophomore level or above must have earned 28 ISU credits including no more than 2 nongraded credits Upperclass students who have been previously honored must have earned 28 ISU credits since they were last honored including no more than 2 ungraded credits A student may be honored no more than four times Recognition of these high-scholarship students appears on their permanent record

3 **Graduation with Distinction** Undergraduates who have a cumulative grade point average of 3 50 or higher at the beginning of their final term are graduated with distinction provided they have completed 60 semester credits of coursework at Iowa State University at the time they graduate Of these 60 credits 50 graded credits are required This recognition appears on the student s permanent record and diploma and in the commencement program Recognition for students graduating in veterinary medicine is based only on the grades earned while enrolled in that college Candidates for the bachelor of liberal studies degree may be graduated with distinction providing that they (a) have achieved a cumulative grade point average of 3 50 or higher for all ISU credits (b) have achieved a cumulative grade point average of 3 50 or higher for all other credits taken at the other Iowa Regent universities and (c) have completed 45 semester credits of coursework at the three Iowa Regent universities at the time of graduation

Academic Privileges and Opportunities

A Credit by Examination

Academic credit may be earned by means of special examinations The Credit by Examination (CBE) program is available to current Iowa State students as well as

prospective and entering students Students with college-level proficiency in particular areas are encouraged to investigate credit by examination early in their college careers The types of CBE programs and the policies and procedures governing them are described in detail on page 11

B Pass-Not Pass Grading

Students wanting to broaden their education at Iowa State may choose to take a maximum of 9 semester credit hours on a Pass-Not Pass basis meaning that only a P or NP will be recorded as their final grade in the course The purpose of P-NP grading is to encourage students to take coursesoutside the usual program of study for their major and minor disciplines The following policies apply

1 Undergraduate students who have earned at least 40 semester credits and who are not on temporary enrollment at the beginning of the semester are eligible (These limits do not apply to courses in physical education) A special student must obtain approval from her or his academic adviser and college dean

2 Only elective courses may be taken on a P-NP basis In specific majors some restrictions may apply so students should consult with their academic adviser

3 Except for restrictions on its own undergraduate majors a department may not deny the availability of any of its course offerings on a P-NP basis

4 Courses offered on a satisfactory-fail basis may not be taken P-NP

5 *Students should register for a P-NP course* via the Touch-tone Registration System in the same manner and at the same time that they register for their other courses Students should then change to P-NP by processing a *schedule change form with their academic* adviser s signature in the P-NP approval section of the form

6 Students electing to change back to a graded basis should process the change using the P-NP section of the schedule change form

7 Changes to or from a P-NP basis may be made within the period ending eight class days following the date on which midterm grades are due (or until three weeks before the end of a summer session) If the change from P-NP to a graded basis is made after the first 10 class days of a semester (first five days of summer session) the course will count toward the total P-NP credits allowed

8 Registration on a P-NP basis is not indicated on the instructor s class list Students will receive a P if their grade is D minus or better and an NP if their grade was F

9 Neither P (earned grade of D minus or better) nor NP (earned grade of F) is counted in calculating a student s grade point average (GPA)

10 Students who pass a course taken under the P-NP system may not repeat the course When students have taken a course and received a grade they may not repeat it for P-NP *credit*

11 When students change their curriculum any P credits that they have accumulated will be accepted by the new department if such credits are in courses normally accepted by the department

12 Credits taken on a P-NP basis at another institution and transferred to Iowa State may be applied as electives in a student s degree program if the credits are otherwise acceptable in that program The number of P-NP transfer credits that can be accepted depends on the number permitted by the institution from which the student is transferring If a student transfers more than nine semester P-NP credits no additional *Iowa State P-NP credits can be applied to the* student s degree program

C Auditing

To audit a course means to enroll in the course without receiving credit for it Students are assessed fees as though they were taking the course for credit and the course counts in determining full-time or part-time student status Changing a course from credit to audit requires dropping the course for credit and adding it as an audit on a schedule change request form If this occurs after day 5 of the semester the drop will count toward the total allowable ISU drops

Requests to audit a course will be honored only if there is space available in the course after the four-week touch-tone registration period has ended Once enrolled in a course auditors have the same rights and privileges as any student taking the course for credit Their names appear on the class list with a notation that they are auditing To change the status of an audited course to a graded course students must process the schedule change request form by day 5 of the semester Audited courses do not appear on the student s permanent record except by *special request from the student* and his or her adviser with evidence showing that she or he was actively involved in the course Audited courses do not apply toward V A benefits

D Independent Study

Most departments offer opportunities for independent study through a 490 catalog listing Usually a minimum of 6 to 10 credits of coursework in the department is required before independent study is permitted Students who are interested in this kind of experience in a particular department should check the catalog to determine the department s prerequisites to register for 490 490H sections are reserved for students in the University Honors Program

Students should check with the department about procedures in addition to meeting the prerequisites for registering for 490 A written plan of study is prepared in advance with a faculty member who has agreed to supervise the student s work to evaluate progress and the final product and to assign a grade Initiation of the plan of study should occur prior to the semester in which enrollment is desired Both the student and the instructor should agree on the number of credits for which she or he will enroll the amount and kind of work he or she will do for that credit and the system by which she or he will be graded (A-F or S/F) Students *should not expect to register for or add* 490 credit without an instructor s permission Some colleges and/or departments have limits on the number of credits of 490 that may be applied toward graduation

Appeal of Academic Grievances

Students who believe a faculty member (in his or her academic capacity) has behaved unfairly or unprofessionally may have their grievance reviewed through the procedure described below A student may not invoke this procedure more than one year following completion of the course and may not initiate the appeal of a course grade beyond midterm of the semester following her or his completion of the course

Prior to initiating a formal appeal a student may wish to discuss the situation informally with a staff member of the Dean of Students Office who can offer advice as to the most effective way to deal with it For grievances pertaining to academic standards decisions refer to page 45

Grievances arising out of classroom or other academic situations should be resolved, if at all possible, with the individual instructor involved If resolution *cannot be reached a student should discuss* the grievance with the instructor s department chair and submit it in writing to him or her The department chair will discuss the grievance with the instructor involved *and/or refer it to a departmental grievance* committee The department chair should respond in writing within five class days If resolution of the grievance cannot be made with the department chair the student may appeal in writing to the dean of the instructor s college (In the case of a grievance involving a Graduate College policy or procedure an appeal of the department chair s decision should be directed to the Dean of the Graduate College rather than to the dean of the instructor s college) The dean will hear the explanations of the department chair and instructor and should respond to the student in writing within ten class days If the grievance cannot be resolved with the dean the student may forward a written appeal to the provost who will convene a quorum of the Committee to Review Student Grievances (see below) to hear the appeal within ten class days Within five class days following the hearing the provost will make a decision in regard to the grievance and will transmit this decision to the grievant the dean the department chair and the instructor An appeal of the provost s decision may be made to the president of the university The time limit specified at each level may be extended by mutual agreement of all parties concerned

The Committee to Review Student Grievances is composed of ten faculty members named by the president of the *Faculty Senate and ten GSB senators named* by the president of the Government of the Student Body The provost serves as a chairperson for the committee but may designate another chairperson for a specific *grievance hearing Faculty members are* appointed for a three-year term with three or four being replaced each year Students are appointed for one-year terms renewable at the discretion of GSB A minimum of two

faculty members two students and the chairperson shall constitute the quorum for a grievance hearing

Student Records

Iowa State University maintains various records concerning students to document their academic progress as well as to record their interactions with university staff and officials In order that their right to privacy be preserved and to conform with federal law the university has established certain policies to govern the handling of student records

Public Information

Certain information concerning students is considered to be open to the public upon inquiry This public information is of two types **directory information** and **other information** not included in the *ISU Directory* **Directory information** includes local address and telephone number home town college curriculum year in school and enrollment status **Other public information** includes mailing address date and place of birth dates of attendance at Iowa State expected date of graduation names of advisers awards and academic honors Iowa State degree(s) and date(s) awarded previous educational institutions attended degrees received dates of attendance, full- or part-time status participation in officially recognized activities and sports and weight and height of members of athletic teams

Public information will be released by the registrar to anyone upon inquiry, unless students have requested that specific items not be released A request to have public information withheld should be made at the Office of the Registrar 214 Alumni Hall If the request is granted the registrar will notify the appropriate university offices

It is the policy of the university to respect the privacy of students therefore only lists and labels containing names of students with directory information will be made available to members of the public This directory information will be provided on a time-available basis for the cost of producing the information Directories are also available in the bookstores for those persons needing directory information

Confidential Information

With the exception of the information noted above all student records are considered to be confidential and are open only to university personnel to offices and agencies carrying out their accreditation and audit functions of university programs, to persons in compliance with a judicial order to organizations conducting studies for or on behalf of educational institutions or agencies for the purpose of developing validating or administering predictive tests administering student aid programs and improving instruction and to persons in an emergency in order to protect the health or safety of students or other persons

The following policies govern access to student records

1 Each type of student record is the responsibility of a designated university official and only that person or the dean or director to whom that person reports has authority to release the record The responsible officials are

a Academic records registrar

b Admissions records director of admissions

c Financial aid records director of financial aid

d Business records university controller

e Traffic and security records director ISU Department of Public Safety

f Medical records director Student Health Center

g Counseling records and test scores director Student Counseling Service

h Actions of academic standards committees college deans

i Disciplinary records dean of students

j Residence hall records director of residence

k Placement records college placement officers

l Evaluations for admission to ISU graduate or professional programs deans or department chairs

m Special academic programs faculty member in charge of the program and the dean of the college

2 The responsible official may release records to university personnel who have a legitimate need for the information University personnel includes students appointed to specified committees A list of those persons who normally have access to each type of student record is available in 214 Alumni Hall

3 All student records are reviewed periodically Information concerning the frequency of review and expurgation of specific records is available in 214 Alumni Hall

4 Students have the right to review upon request any records that pertain directly to them and may obtain a copy of the record at cost This provision does not apply to records to which the student has waived his or her right to review nor does it apply to medical and counseling records

5 A student may waive the right to review a specific record by submitting in writing a statement to this effect to the official responsible for that record

6 A file containing copies of records pertinent to advising is maintained on each student for use by the student s adviser Ordinarily this file is kept in the possession of the adviser but for convenience it may be stored elsewhere such as in the department office When the student changes majors or changes advisers within the same major the file is transferred to the new adviser Under the university's student records policy the student is considered to have the right of access to this file

7 Medical and counseling records shall be released at the written request of the student to medical or psychological professionals outside the university or to university officials

8 University personnel who have access to student records in the course of carrying out their university responsibilities shall not be permitted to release the record to persons outside the university unless authorized in writing by the student or unless one of the exceptions stated earlier is involved

9 Confidential information may be released to parents by obtaining the student s written consent or by having the parent establish the student s dependency as defined by the Internal Revenue Code of 1954 section 152 by furnishing a certified copy of the parent s most recent federal income tax return

10 Iowa high schools receive a freshman year report containing first year academic progress data of all their graduates attending Iowa State University for the purpose of evaluating and improving their instructional programs

11 The officials responsible for custody of student records will maintain records of requests and disclosures of personally identifiable nonpublic information The records of requests whether granted or not shall include the person or agency requesting the information and the purpose of the release These records of requests and disclosures will be available to the student on request Records of requests and disclosures are not necessary for requests made by the student by school officials in carrying out their official responsibilities by persons employed by agencies and offices conducting audits and accreditations of university programs or any of the other exceptions listed previously

Posting Grades and Test Scores

The test scores of students or student course grades may be posted in public locations to inform students of their performance provided that the information is presented in such a way as not to reveal the name or entire social security number of specific individuals

Release of Grades

Reports of a student's grades are not routinely sent to the student s parents Parents of students under 18 years of age may obtain grades by writing to the Office of the Registrar The grades of other students will be sent to their parents only with written permission of the student or by establishing dependency as outlined in item 9 under Confidential Information

When Records May Be Withheld

The appropriate university official may request that a student s record not be released if that student is delinquent in an account with the university or an affiliated organization The effect of this action is that a transcript will not be released and registration will be withheld

The appropriate official may also request that records be withheld in instances when official disciplinary action has been taken against a student

Authorization for these actions is supported by *The Iowa Code* and *The Iowa Administrative Code*

In order for such an action to be rescinded the Registrar s Office must receive written *authorization from the official who originally* requested the action indicating that the student has met the obligation Further information about this policy can be obtained from the Office of the Registrar

Review and Challenge of Records

A student may challenge the accuracy of handling of records maintained by the university on grounds that the records are inaccurate misleading or otherwise violate the privacy or other rights of the student The university has established the following procedures to provide an opportunity for the student to correct or delete inaccurate records or to insert into the record a written explanation of the content

Students who question their records should discuss the issue first with the individual staff person who established or maintains the records Presumably most issues can be resolved at this level If a satisfactory resolution cannot be reached the student should submit the question to the head of the department in which the record is maintained

The department head will discuss the issue with the staff person and the student challenging the record If resolution cannot be reached after meeting with the department head the student may submit the question to the dean or director to whom the department head is responsible The dean or director will investigate and will respond in writing

If the record has not been reconciled through these measures the student may direct a written request to the president of the university The president will convene an Ad Hoc Hearing Panel of Access and Confidentiality of Educational Records, composed of two faculty members two students and one administrator appointed by the president for a period of one year, with the president or a designee serving as nonvoting chairperson The student shall be given an opportunity to present to the panel evidence relevant to the issues raised and the panel will issue a written response

Requests for Social Security Numbers

In general the student and employee records systems of the university are based on an identification number identical to the social security number of the person concerned in the record Although economy and safe handling of records are enhanced by use of a common identification number known to a person without prior contact with the university procedures have been established by the registrar for assignment of an alternate number should a person so request

Requests by persons administering university programs for a student s social security number are legally supported by the *Iowa Code* and the *Iowa Administrative Code* The identification number will be used for administrative coordination and record-identification purposes only Use of the *number in a manner which identifies it with a* particular student s name shall fall within the definition of confidential information as used in this section on student records

Designators

A E	Agricultural Engineering
A Ecl	Animal Ecology
Acct	Accounting
Ad Ed	Adult and Extension Education
Aer E	Aerospace Engineering
Af Am	African American Studies
AFAS	Air Force Aerospace Studies
AgEdS	Agricultural Education and Studies
Agron	Agronomy
Am In	American Indian Studies
An S	Animal Science
Anthr	Anthropology
Arch	Architecture
Art	Art and Design
Art H	Art History
ArtCD	Art Craft Design
ArtDP	Art Drawing/Painting/Printmaking
ArtEd	Art Education
ArtGr	Art Graphic Design
ArtID	Art Interior Design
ArtVS	Art Visual Studies
AST	Agricultural Systems Technology
Astro	Astronomy and Astrophysics
Ath	Athletics
Av T	Aviation Technology
B B	Biochemistry and Biophysics
B M E	Biomedical Engineering
Biol	Biology
Bot	Botany
BPM I	Biological/Pre-Medical Illustration
BusAd	Business Administration
C E	Civil Engineering
C R P	Community and Regional Planning
Ch E	Chemical Engineering
Chem	Chemistry
Chin	Chinese
CJ St	Criminal Justice Studies
Cl St	Classical Studies
CLSMT	Clinical Laboratory Science/ Medical Technology
CmDis	Communication Disorders
Co Ed	Counselor Education
Com S	Computer Science
ComSt	Communication Studies
Con E	Construction Engineering
Cpr E	Computer Engineering
Curr	Curriculum and Instructional Technology
Cyto	Cytotechnology
Dance	Dance
Dsn S	Design Studies
E E	Electrical Engineering
E M	Engineering Mechanics
E Sci	Engineering Science
Econ	Economics
EdAdm	Educational Administration
EEB	Ecology and Evolutionary Biology
El Ed	Elementary Education
Engl	English
Engr	Engineering
Ent	Entomology
Env S	Environmental Studies
F Lng	Foreign Languages and Literatures
FCEdS	Family and Consumer Sciences Education and Studies
Fin	Finance
For	Forestry
Frnch	French
FS HN	Food Science and Human Nutrition
Gen	Genetics
Genet	Genetics—Interdisciplinary
Geog	Geography
Geol	Geology
Ger	German
Geron	Gerontology
Gr St	General Graduate Studies
Greek	Greek
H P C	Historical Philosophical and Comparative Studies in Education
H S	Health Studies
HD FS	Human Development and Family Studies
Hg Ed	Higher Education
Hist	History
Hort	Horticulture
HRI	Hotel Restaurant and Institution Management
I E	Industrial Engineering
I R	Industrial Relations
IEd T	Industrial Education and Technology
IntSt	International Studies
Ital	Italian
IVTE	Industrial Vocational Technical Education
JI MC	Journalism and Mass Communication
L A	Landscape Architecture
LAS	Liberal Arts and Sciences
Latin	Latin
Lib	Library
Ling	Linguistics
M E	Mechanical Engineering
M S	Military Science
M S E	Materials Science and Engineering
Math	Mathematics
MCDB	Molecular Cellular and Developmental Biology
Mgmt	Management
MIPM	Microbiology, Immunology and Preventive Medicine
Mkt	Marketing
Mn Rs	Mineral Resources
Mteor	Meteorology
Music	Music
N S	Naval Science
Neuro	Neuroscience
Nuc E	Nuclear Engineering
O Saf	Occupational Safety
P E	Physical Education
P M	Pest Management
Phil	Philosophy
Phys	Physics
Pl P	Plant Pathology
Pl HP	Plant Health and Protection
Pol S	Political Science
Port	Portuguese
Psych	Psychology
Relig	Religious Studies
ResEv	Research and Evaluation
Rus	Russian
SecEd	Secondary Education
So Wk	Social Work
Soc	Sociology
Sp Cm	Speech Communication
Sp Ed	Special Education
Span	Spanish
Stat	Statistics
T C	Textiles and Clothing
T SC	Technology and Social Change
Thtre	Theatre
Tox	Toxicology
TrLog	Transportation and Logistics
Tr Pl	Transportation Planning
U St	University Studies
V An	Veterinary Anatomy
V C S	Veterinary Clinical Sciences
V Med	Veterinary Medicine
V P P	Veterinary Physiology and Pharmacology
V Pth	Veterinary Pathology
W Res	Water Resources
W S	Women s Studies
Zool	Zoology

Colleges and Curricula

The university is organized into nine colleges including the Graduate College These colleges offer degree programs in the following curricula and majors (For a complete list of majors at the graduate level see the summary at the end of the *Graduate College* section of this catalog)

The main academic programs of each college are listed here together with the degrees or certificates awarded upon completion In many cases certain majors options or electives allow for increased specialization within the programs Programs which are administered jointly by two colleges are listed within both colleges

College of Agriculture

Agricultural Biochemistry B S
Agricultural Business B S
Agricultural Education B S M S Ph D
Agricultural Extension Education, B S
Agricultural Studies B S
Agricultural Systems Technology B S
Agriculture M Agr
Agronomy B S M S Ph D
Animal Ecology B S M S Ph D
Animal Science B S M S Ph D
Biochemistry and Biophysics M S Ph D
Dairy Science B S
Dietetics B S
Economics M S Ph D
Entomology B S M S Ph D
Environmental Studies B S
Fisheries and Wildlife Biology B S
Food Science B S
Food Science and Human Nutrition M S , Ph D
Food Science and Technology M S Ph D
Forestry B S M S Ph D
Genetics B S
Horticulture B S , M S Ph D
International Agriculture B S
Microbiology B S
Microbiology Immunology and Preventive Medicine M S Ph D
Nutrition M S Ph D
Nutritional Science B S
Pest Management B S
Plant Health and Protection B S
Plant Pathology M S Ph D
Professional Agriculture B S
Public Service and Administration in Agriculture B S
Seed Science B S
Sociology, M S Ph D
Zoology B S

College of Business

Accounting B S
Business Administration M B A
Business Administrative Sciences M S
Finance B S
Management B S
Management Information Systems B S
Marketing B S
Transportation and Logistics B S

College of Design

Architecture B Arch M Arch
Art and Design B A B F A M A M F A
Art Education M A (specialization)
Graphic Design B F A M F A
Interior Design B F A M F A
Community and Regional Planning B S M C R P
Landscape Architecture B L A M L A

College of Education

Education M Ed M S Ph D
Elementary Education B S
Environmental Studies B S
Industrial Education and Technology B S M S Ph D
Community Health Education B S
Physical Education B S M S
Secondary Education (See licensure programs offered by the colleges of Agriculture Design Family and Consumer Sciences and Liberal Arts and Sciences)

College of Engineering

Aerospace Engineering B S M Eng M S Ph D
Agricultural Engineering B S M Eng M S Ph D
Biomedical Engineering M S Ph D
Ceramic Engineering B S
Chemical Engineering B S , M Eng M S Ph D
Civil Engineering B S M S Ph D
Computer Engineering B S M Eng M S Ph D
Construction Engineering B S
Electrical Engineering B S M Eng M S Ph D
Engineering Mechanics M Eng M S Ph D
Engineering Operations B S
Engineering Science B S
Industrial Engineering B S M Eng M S Ph D
Mechanical Engineering B S M S Ph D
Metallurgical Engineering B S
Nuclear Engineering M S Ph D

College of Family and Consumer Sciences

Apparel Merchandising Design and Production B S
Child and Family Services B S
Dietetics B S
Early Childhood Education B S
Family and Consumer Sciences Education B S

Family Resource Management and Consumer Sciences B S
Food Science B S
Food Science and Technology M S Ph D
Home Economics Education M S M Ed Ph D
Hotel Restaurant and Institution Management B S M S Ph D
Housing and the Near Environment B S
Human Development and Family Studies M S Ph D
Nutrition M S Ph D
Nutritional Science B S
Studies in Family and Consumer Sciences B S
Teaching Prekindergarten and Kindergarten Children B S
Textiles and Clothing M S Ph D

College of Liberal Arts and Sciences

Advertising B A
Anthropology B A B S M A
Biochemistry B S M S Ph D
Biological/Pre-Medical Illustration B A
Biology B S
Biophysics B S M S Ph D
Botany B S M S Ph D
Chemistry B A B S M S Ph D
Computer Science B S M S Ph D
Earth Science B A B S M S Ph D
Geological and Atmospheric Sciences M S Ph D
Geology B S
Economics B A B S M S Ph D
English B A B S M A Ph D

Environmental Studies B A B S
Foreign Languages and Literatures
French B A
German B A
Russian B A
Spanish B A
Genetics B S
History B A B S M A Ph D
Interdisciplinary Studies B A B S
International Studies B A B S
Journalism and Mass Communication B A B S M S
Liberal Studies B L S
Linguistics B A
Mathematics B S M S M S M Ph D
Meteorology B S M S Ph D
Music B A B Mus
Naval Science B S
Philosophy B A
Physics and Astronomy B S M S Ph D
Political Science B A M A M P A
Psychology B S M S Specialist Ph D
Religious Studies B A
Social Work B A B S
Sociology B A B S M S Ph D
Speech Communication B A B S
Statistics B S M S Ph D
Zoology B S M S Ph D

College of Veterinary Medicine

Biomedical Engineering M S Ph D
Veterinary Anatomy M S Ph D
Veterinary Clinical Sciences M S
Veterinary Medicine D V M
Veterinary Microbiology M S Ph D
Veterinary Pathology M S Ph D
Veterinary Physiology M S Ph D
Veterinary Preventive Medicine M S

Graduate College

The Graduate College administers the graduate programs listed above as well as the following interdepartmental programs

Ecology and Evolutionary Biology M S Ph D
General Graduate Studies M A M S
Genetics M S Ph D
Gerontology (minor only)
Housing (minor only)
Immunobiology M S Ph D
Industrial Relations M S
Linguistics (minor only)
Mineral Resources (minor only)
Molecular Cellular and Developmental Biology M S Ph D
Neuroscience M S Ph D
Plant Physiology M S Ph D
Technology and Social Change (minor only)
Toxicology M S Ph D
Transportation Planning M S
Water Resources M S Ph D

Bachelor's Degree Requirements

To receive a degree a student must meet the requirements of the curriculum in which the degree is to be awarded Verification that the student has met those requirements is made by the dean of the college who also has the authority to waive a requirement under exceptional circumstances

A cumulative grade-point average of at least 2 00 in all work taken at Iowa State University is required for graduation

A student admitted as a transfer from another college or university is required to have a 2 00 cumulative average A student may however be admitted with a quality-point deficiency but will be required to earn sufficient quality-points above a 2 00 at Iowa State to offset the quality point deficiency at the time of entrance

A student who takes work at another college or university after having been enrolled at Iowa State must submit transcripts of all work attempted to the Office of Admissions at Iowa State This work must average a 2 00 or the deficiency of quality points will be assessed against the student Failure to submit such transcripts will be grounds for dismissal

In unusual circumstances the academic standards committees of the respective colleges may review and give further consideration to the records of students who except for grade point average have satisfactorily completed all graduation requirements If the appropriate college academic standards committee considers that the educational and professional needs of such a student have been satisfactorily met or can be satisfactorily met by imposing further conditions the committee may recommend to the dean of the college that the student be graduated or that a supplemental program be accepted in place of the fully unqualified grade-point average The college academic standards committee chairperson reports such exceptional actions to the Faculty Senate Committee on Academic Standards and Admissions

To qualify for a baccalaureate degree a student must take a minimum of 32 credits in residence at Iowa State Also required is that the last 32 credits must be taken in residence although under special circumstances with prior written approval of the student s major department six of the last 32 credits may be transferred from a four-year college and applied toward a degree at Iowa State

A student may receive two bachelor s degrees if he or she meets the requirements of each curriculum and earns at least 30 credits beyond the requirements of the curriculum requiring the greater number of credits Each degree program must be approved by the appropriate department chair or head

A student fulfilling the requirements of two separate curricula in different colleges may in certain cases receive a degree from one of the colleges with double majors crossing college lines The permissions of both deans must be obtained and each degree program must be approved by the appropriate department and dean

Minors

Requirements for an undergraduate minor are specified by many departments and programs in the university a record of completion of such requirements appears on a student's transcript The purpose of certifying a minor on the transcript is to demonstrate that the student has actively and consciously engaged the intellectual issues central to that

discipline Lists of undergraduate minors offered by each college appear in the college description minors offered by cross-disciplinary programs not administered by a single college include gerontology international studies and technology and social change Undergraduate students in any college may elect to meet the requirements of any undergraduate minor offered in the university Credits used to meet the minor requirements may also be used to satisfy the credit requirement for graduation and to meet credit requirements in courses numbered 300 or above Some students may however have to exceed the graduation credit requirement set by their college in order to meet the requirements of both the minor and the curriculum/major

All minors require at least 15 credits including at least 6 credits taken at Iowa State University in courses numbered 300 or above The minor must include at least 9 credits that are not used to meet any other department college or university requirement Specific requirements and/or restrictions are available from the department or program offering the minor

English Proficiency Policy

Iowa State University believes that written communication is a fundamental skill of an educated person therefore its graduates are expected to acquire reasonable competence in written communication during their educational careers The following are designed to insure that this competence is developed and maintained

1 All students must earn credit in a sequence of basic composition courses (e g English 104 and 105) normally in the freshman year

2 Continued development of communication skills following the freshman year is the responsibility of the student's major department This development may be promoted by requiring and critically evaluating term papers and other written assignments as part of courses offered by the department and by encouraging students to enroll in advanced English composition courses that meet their particular needs

3 Each department is responsible for certifying that its majors have achieved an adequate level of proficiency in written communication at the time of graduation

English Requirement for International Students

International students whose first language is not English must demonstrate ability to study in this English-speaking university Such students—beginning as well as those who transfer from other institutions—must take an English placement test when they arrive on campus The test is administered by the English Department and is offered at the opening of each semester

Students whose performance on this placement examination is satisfactory will follow the regular English requirements of their major department Students who have deficiencies will enroll in special English classes as determined by the test results

Library Study

Independent study and investigation through the use of books and libraries enable students to grow intellectually and professionally in college and afterward For this reason all students receive instruction in the use of the University Library including practice in how to locate the published literature of their respective fields of study

Curriculum Requirements

The curriculum requirements both in number of credit hours and specific courses are guidelines for the student and his or her adviser in planning an academic program The curriculum is subject to change and because of these changes adjustments may need to be made

Catalog in Effect

A student may choose to graduate under the catalog in effect at the time of graduation or one of the two immediately preceding catalogs provided it covers a period of his or her enrollment Full requirements of the chosen catalog must be met except that adjustments will be made in instances where courses are no longer available or where programs have been changed

Special Programs

Honors Program

The Iowa State University Honors Program is designed for students who have demonstrated the ability and motivation to assume more than the usual responsibility for their undergraduate education Students in the Honors Program determine their educational objectives and devise an individualized program of study to meet these objectives An honors program may include substitutions for required courses, combinations of courses from several departments to form a new major or minor honors courses and seminars independent study and research and other forms of innovation The goal is to enable honors students to gain maximum benefit from their undergraduate education

Each undergraduate college operates its own Honors Program The college Honors Program committees admit students into the program approve programs of study and are responsible for the administration of their college Honors Program The University *Honors Program Committee which* includes the chairs of each college program is responsible for the general coordination of the college and freshman honors programs

Special educational opportunities Honors courses and honors sections of regular courses are offered by various departments These courses open only to Honors Program members have limited enrollment and are taught by specially selected instructors An honors student may also designate any course as an honors course by making appropriate arrangements with the course instructor and obtaining approval of the Honors Program coordinator

The University Honors Program offers honors seminars which are open only to Honors Program students These seminars which have limited enrollments and are offered only on a satisfactory-fail basis are listed under University Studies 321 and 322

A listing of honors courses and seminars for the current academic year may be obtained from the Honors Program Office Osborn Cottage

Most departments offer opportunities for independent study and research under 290 or 490 When designated by an H these courses carry honors credit Research grants are available to support honors research

Other benefits Among the benefits for all members of the Honors Program are individual VAX accounts access to Osborn Cottage as a quiet place to study and visit with other Honors students and opportunities to attend Honors semesters and Wingspread conferences off campus Full members—those with approved honors degree programs—receive extended loan privileges at the Library priority scheduling and the opportunity to apply for research funds

Eligibility Students who have a cumulative grade-point average of at least 3 35 become eligible to apply for admission to the Honors Program during their second semester in residence and continue to be eligible for admission as long as they have at least 48 semester credits remaining before graduation Decisions with respect to admission are made by the college Honors Program committees

Freshman Honors Program Entering freshmen with outstanding high school records and academic ability may be eligible to participate in the Freshman Honors Program The Freshman Honors Program which is designed to introduce students to an honors education consists of special honors sections of English 105 and Library 160 a Freshman Honors Seminar and advising by *specially selected honors advisers Admission* is limited and by invitation and is based on past academic achievement potential and interest in an honors education

Further information Further information concerning the University Honors Program and the Freshman Honors Program can be obtained from the Honors Program Office in Osborn Cottage

Inter-institutional Programs

Students have the opportunity to complete two years of study at another institution and the last two years at Iowa State through coordinated programs offered by the College of Family and Consumer Sciences

Dual-degree Programs

Students who complete the first three years in certain curricula at Iowa State and who satisfactorily complete the first year in a recognized medical dental veterinary medical or law curriculum may then be awarded the baccalaureate degree from Iowa State (See *Index Preprofessional Study*)

Iowa Lakeside Laboratory

The Iowa Lakeside Laboratory at Lake Okoboji is a cooperative program in teaching and research in the biological sciences sponsored jointly by Iowa State University the University of Iowa and the University of Northern Iowa The laboratory offers course work during two terms of five weeks each in June July and August

Gulf Coast Research Laboratory

Through its affiliation with the Gulf Coast Research Laboratory at Ocean Springs Mississippi Iowa State offers its students the opportunity to enroll in courses or do research in a marine environment by enrolling at Iowa State and paying Iowa State tuition Courses available to Iowa State students during the two summer terms at the laboratory are listed under the course descriptions of the departments of Animal Ecology Botany Microbiology Immunology and Preventive Medicine and Zoology and Genetics Brochures may be obtained by writing or visiting 201 Bessey Hall

Federal Cooperative Education Program

Federal Cooperative Education combines classroom learning with paid work experience through either alternate (full-time) or parallel (concurrent part-time) periods of work and study In general students under this program will require one year more to complete the usual curriculum requirements Initial placement usually comes after completion of the first or second year

The student must observe regulations of the employer and not expect special treatment University holidays do not apply to cooperative students nor are students allowed time off for university activities A student may not enroll in classes at any educational institution during a period of full-time cooperative employment without university approval Those in a cooperative program are considered by the university to be students subject to university regulations concerning conduct during this period and are liable to dismissal from the university for misconduct on the job They may continue

living in university housing during work periods Cooperative students pay no fees to the university during work periods but may attend student activities provided they pay the activity fee

The Washington Center Program

Iowa State University in conjunction with The Washington Center offers its students the opportunity to gain academic credit and first-hand experience in the governmental non-profit and private sectors through a semester-long internship in the nation's capital The Washington Center the largest non-profit organization of its kind places students in a variety of internships and also offers a wide array of academic programs and seminars to complement their internship experience Further information about the requirements and the credit arrangements can be obtained from the Department of Political Science

Regent Universities Student Exchange Program

Iowa State students may take courses at either of the other two Regent universities for Iowa State resident credit Regular degree-bound students in good standing at any of the three Regent universities may attend another Regent university for a maximum of two semesters and the credits earned at the other university will be counted as resident credit at the home institution Approval for participation and credit in the exchange program must be obtained well in advance of registration since the department head must approve the acceptance of such credits if these are to apply to the major and to insure complete processing of the application between the cooperating universities within specified dates for enrollment Detailed information and application forms for the exchange program are available from the Office of the Registrar

Study Abroad

In keeping with the university's international mission Iowa State offers over 40 study abroad programs each year ranging from academic year exchanges for students in any field of study to shorter group programs designed for specific majors In addition Iowa State students may make independent arrangements to study abroad providing credit transfer approval is granted in advance by the Admissions Office and the appropriate academic department(s)

Information about study abroad opportunities and requirements is available at the Study Abroad Center E O Building Tel (515) 294-6792 See also individual department and college listings

Exchange Programs

Students may spend an academic year abroad while paying fees based on tuition room and board at Iowa State Select from over one hundred institutions in the following countries Argentina Australia Austria Brazil Belgium Canada Colombia Costa Rica Côte d'Ivoire Cyprus Dominican Republic England Estonia Fiji Finland France Germany Honduras Hong Kong Hungary Italy Kenya Malta Mexico Netherlands New Zealand Philippines Taiwan ROC Russia Scotland South Korea Spain Sweden Switzerland Tanzania Thailand Togo Uruguay Wales or Zambia

Language Programs

Three language programs (French German and Spanish) are offered each summer in France Austria and Spain and last approximately eight weeks Students may earn between eight and twelve Iowa State credit hours while participating in a rich cultural experience The minimum requirement for enrollment in the programs is two years of university-level study of the appropriate language or equivalent Further information about requirements and specific courses can be obtained from the Department of Foreign Languages and Literatures

Students with limited exposure to Spanish may select from two programs a six-week summer program at the Instituto Tecnologico y de Estudios Superiores de Monterrey Mexico or a fall or spring semester program offering up to sixteen hours of Iowa State credit in Cuernavaca Mexico The program in Cuernavaca just one hour south of Mexico City also provides students the opportunity to live with a Mexican family

London Semester

Iowa State University in conjunction with the other Iowa Regent universities offers a program in London England each year Classes are offered in the humanities social sciences and business and include such courses as history of English theater British politics and government British art and architecture and introduction to international business Participants can earn up to 15 Iowa State credit hours in courses taught by American and British faculty

Internships

A limited number of paid internships are available through the Study Abroad Center for students majoring in engineering natural and physical sciences business agriculture and forestry

Financial and Credit Transfer

With the exception of college work study students may apply their financial aid to the cost of studying abroad Scholarships are also available for certain programs Further transfer credit earned while abroad may still fulfill graduation requirements and with careful planning students should not have their graduation delayed

Note A number of programs assess a fee to cover administrative costs associated with the program For information on these fees and program costs please consult the Study Abroad Center or relevant department

Military Training

Iowa State students may elect to participate in one of the Reserve Officers Training Programs (ROTC) offered at Iowa State by the Army the Navy and the Air Force Descriptions of the specific programs are found under the departments of Air Force Aerospace Studies Military Science and Naval Science A student who completes a four-year program in any of these fields may be commissioned as a military officer at the time of graduation

Late Afternoon, Evening, and Saturday Classes

In order to make on-campus courses available to those who live within commuting distance of Ames classes are scheduled in the late afternoon and evening so that persons with full-time employment or other responsibilities may commute and continue their education The university publishes a brochure announcing these courses each semester which may be obtained by writing or calling the Office of Admissions Alumni Hall Iowa State University Ames Iowa 50011 Information regarding any of these programs may also be obtained by contacting the Office of Admissions

Off-Campus Credit Courses and Programs

Land-grant institutions including Iowa State have thrown open the doors of higher education to all people ISU faculty and staff believe Iowans should have access to the ideas and knowledge available on campus Therefore a number of credit courses and programs are available at off-campus locations A variety of delivery methods including videotape compressed video audio teleconferencing satellite transmission and traditional classroom instruction is utilized to achieve specific educational goals and objectives

Courses are the same as those offered on campus carry residential credit and are taught by ISU faculty members Credit earned in off-campus courses becomes a part of the student s academic record at Iowa State and may be used to meet degree requirements in the same manner as credit earned on campus

ISU Continuing Education personnel provide leadership and support to faculty in their efforts to identify the needs of Iowans and to reach and satisfy adult learners who wish to earn college credit without attending classes on campus

Anyone interested in currently available courses and their locations or in requesting courses and programs in specific subject matter and locations should contact Continuing Education (515-294-4750 or toll-free 1 800-262-0015) ISU or one of the seven ISU Area Extension offices located in

Cedar Rapids—(319) 398-2040
Des Moines—(515) 270-8114
Mason City—(515) 424-5432
Ottumwa—(515) 682-8324
Waterloo—(319) 232-6654
Atlantic—(712) 243-5750
Storm Lake—(712) 732-2584

Some off-campus credit courses are offered to serve the special interests or needs of a particular group and are not part of any special program However in many locations a series of courses may be offered to fulfill certain academic or educational objectives Current programs offered are listed below

Master of Agriculture

The major in professional agriculture is an off-campus program leading to the degree master of agriculture It is available to students who wish to pursue graduate study in agriculture with minimum coursework on campus The program is considered to be a terminal master s degree The professional agriculture master program combines core courses with a program of individual interest Core courses are offered in five disciplines agricultural economics agricultural systems technology agronomy animal science and horticulture All departments in the College of Agriculture participate in the degree program Courses are delivered via videotape live television satellite broadcast and face-to-face instruction Students are required to take a minimum of two courses in each of three disciplines and complete 24 semester credits of formal course work

A minimum of four credits of creative component experience is required A thesis option is not available The creative component is a demonstration of independent creativity with a written report of laboratory field or library research acceptable to the student s program of study committee Four workshops of one credit each are required A workshop in applied statistics is mandatory Two of the workshops are offered only on campus

The program of study committee in consultation with the student will determine an individualized curriculum and the acceptability of transfer credits and on-campus course work The major professor should be selected from the discipline where a concentration of course work will be taken

Students who wish to pursue this off-campus major must meet the same admission requirements as other students seeking admission to graduate study

For more information about ISU s professional agriculture degrees call toll-free 1-800-747-4478 or (515) 294 9666

Master's Programs in Education

The College of Education endeavors to identify needs of educators across the state and provide suitable courses and programs to satisfy these needs Components of master s degree programs in counselor education vocational education research and evaluation special education curriculum and instructional technology physical education elementary education educational administration industrial education and technology adult and extension education higher education and historical philosophical and comparative studies in education are or may be offered in various parts of the state

For more information about master s programs in education call (515) 294-7003

Master's Programs in Engineering

The faculty of the College of Engineering offers master of science and master of engineering programs at employment sites throughout the state to engineers who wish

to pursue graduate study off campus Courses are available in all engineering curricula

Curricular requirements are identical with those on campus as are admissions policies and procedures The program of study committee in consultation with the student will determine the courses needed and the acceptability of transfer credits and on campus coursework

For more information about master s programs in engineering call (515) 294-7470 or (515) 294-8577

Master's Program in Family and Consumer Sciences

The College of Family and Consumer Sciences provides a variety of courses to meet the needs of students who are pursuing a master s degree who want general updating in the field or who want courses for certificate renewal Currently departments within the college offer independent master s degree programs Specific course requirements depend on the student s needs and interests Courses off campus are offered in late afternoons evenings or weekends to allow persons with full-time occupations to attend classes

For more information about master s programs in family and consumer sciences call (515) 294-7244

Bachelor of Liberal Studies

The bachelor of liberal studies (B L S) is a general studies degree in the liberal arts specifically designed for students who have completed at least two years of college and wish to finish an undergraduate degree without attending classes on campus The degree is offered by the College of Liberal Arts and Sciences Rather than a traditional major students select coursework from three of the following five distribution areas humanities communications and arts natural sciences and mathematical disciplines social sciences and professional fields

The B L S degree is offered with similar requirements by all three Regent universities and provides a framework for off-campus students to assemble all of the educational opportunities they may have locally available into a coherent four-year educational program The Regent universities and other four-year colleges support the third and fourth years of study Formal admission to the B L S program is granted only after students have completed an associate in arts or associate in science degree from an accredited two-year college or have completed at least 62 semester credits acceptable toward graduation at the chosen Regent university with a grade point average of at least 2 00

For more information about the B L S degree call toll-free 1-800-262-3810 or (515) 294-4831

Professional Agriculture Bachelor of Science

The faculty of the College of Agriculture offer a bachelor of science degree in professional agriculture The program provides a high-quality flexible curriculum for those with at least two years of college who wish to work on a bachelor s degree away from the Ames campus The course of study encompasses three major areas animal science agricultural social science and economics and plant and soil science The agricultural coursework a minimum of 45 credits is a well-rounded mix of agricultural topics delivered via videotape satellite transmissions off-campus site classes and on-campus workshops and laboratories All 15 departments in the College of Agriculture participate in the professional agriculture degree program Students may take a portion of their course work from colleges in close proximity to their home and transfer the credit to ISU

For more information about ISU s professional agriculture degrees call toll-free 1-800-747-4478 or (515) 294 9666

Continuing Education Units

Continuing Education Units (CEUs) may be awarded for short courses workshops and other educational activities sponsored by Iowa State University which do not carry academic credit A given activity may award CEUs to some participants and academic credit to others under the following policies

1 The activity must be administered through Iowa State University Continuing Education

2 The dual arrangement must have received prior approval by the department head or chair upon recommendation of the course instructor and the department curriculum committee

3 Participants may enroll for either CEUs or for credit but not for both

4 Credit enrollees must meet the same academic standards they would have to meet if the course did not also award CEUs to some participants

5 Assignments for credit enrollees must be clearly articulated Substantial sequential learning experiences and careful evaluation of outcomes are required for academic course credit these standards will not be reduced to accommodate the participation of CEU learners Whenever graduate credit is offered course prerequisites will be enforced and not routinely waived

Once CEUs have been awarded no participant may change his or her enrollment to academic credit Standard university policies for determining fees will be applied to all participants depending on the status of their enrollment

Participants must be informed ahead of time that once CEU s have been awarded to them Iowa State cannot and will not convert them to academic credit Further a student can switch from CEU to credit *during* an offering only at the discretion of the course instructor

Tuition is set by the Iowa Board of Regents for both on-campus and off-campus credit courses Fees for non-credit and CEU offerings are individually calculated to ensure coverage of the instructional and delivery costs of each learning event

Admission

Undergraduate and Special Students A high school graduate may enroll in off-campus undergraduate courses as a special student However after the accumulation of a number of college credits a formal application for admission as a regular undergraduate student should be accomplished and an adviser obtained (See *Admission of New Undergraduate Students*)

Graduate Students A graduate of a regionally accredited college or university in the United States may enroll occasionally in off-campus graduate courses as a nondegree graduate student However only 9 semester hours of graduate credit earned under the nondegree option may be applied if the student later chooses to enter a degree program Transfer from nondegree status to full graduate admission requires the completion of procedures specified by the Graduate College (See *Graduate College Admissions*)

Enrollment

Enrollment in off-campus courses can be accomplished by contacting the ISU registrar or one of the area extension offices listed above

Early enrollment helps ensure that a course is not canceled for lack of registrants Registration dates for each semester are announced in published schedules

Off-Campus Fees For information on off-campus fees contact ISU Continuing Education

Withdrawal and Refund A student who wishes to withdraw from a course must first notify the instructor and then the Office of the Registrar 210 Alumni Hall Iowa State University Ames Iowa 50011 Refund information is available from the Office of the Registrar or ISU Continuing Education

Minimum Enrollment A minimum enrollment is required to permit the offering of an off-campus class

Services

Academic Advising Individuals may obtain advice about educational plans whether registered as an ISU student or not Academic advising is essential when contemplating an ISU degree to ensure that all coursework applies toward a particular degree s requirements To talk with an adviser from a particular department or discipline call Continuing Education

Activity Fee Off-campus students may pay an activity fee in addition to course fees each semester which qualifies them and their spouses for student admission rates to concerts lectures and athletic events Students wanting to pay the activity fee should notify the Office of the Registrar or write a note on their registration form requesting the activity fee

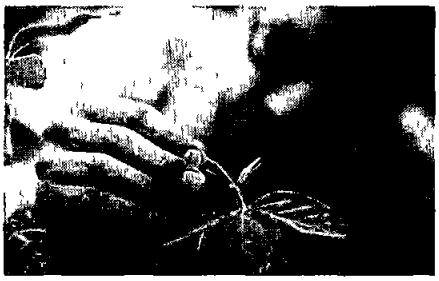
Library Off-campus students in good standing (fees paid) may use the ISU Library by simply identifying themselves The library has access to records of all students enrolled Temporary library cards are also available through instructors

Adult Student Services Students may obtain counseling assistance concerning plans to return to school career goals balancing homework household and job responsibilities brushing up on reading and study skills For assistance call (515) 294-1020 or toll free 1-800-262-3810 and ask for the adult student counselor

Textbooks Textbook order forms are mailed as soon as a sufficient number of students enroll to fill a class Students order pay for and receive books by UPS from University Book Store Occasionally an instructor chooses to bring textbooks to the first class meeting and have students purchase them at that time

Veteran Benefits The Office of the Registrar will provide advice concerning application and certification for veteran s benefits

Financial Aid The Office of Financial Aid will provide advice and assistance for off-campus students interested in financial aid Aid may or may not be available depending upon the number of credits carried the student s qualifications and various other factors



College of Agriculture

David G Topel Dean

Departments of the College

Agricultural Education and Studies
Agricultural Economics
Agricultural and Biosystems Engineering
Agronomy
Animal Ecology
Animal Science
Biochemistry and Biophysics
Entomology
Food Science and Human Nutrition
Forestry
Horticulture
Microbiology Immunology and Preventive Medicine
Plant Pathology
Sociology
Zoology and Genetics

Students enrolled in the College of Agriculture are provided a broad-based education which includes coursework in communications biological physical and social sciences humanities and technical subject matter

Upon graduation students find diverse career opportunities because of the well balanced education they have received as undergraduates in their chosen curricula in the College of Agriculture Opportunities for graduates include production agriculture business and industry public agencies education biological and environmental sciences and graduate studies

Curricula in Agriculture

A student has a variety of curricula from which to choose Each curriculum is unique yet there are courses common to many curricula This is helpful to students in that they may transfer from one curriculum to another in the College of Agriculture before the second year with little if any loss of credits In some departments specialization options further define the curricula and required coursework In all cases curricula are designed to assist the student in preparation for his or her chosen profession Curricula in agriculture are

Primary Majors

Agricultural Biochemistry
Agricultural Business
Agricultural Education
Agricultural Studies
Agricultural Systems Technology
Agronomy
Animal Ecology
Animal Science
Dairy Science
Dietetics
Entomology
Fisheries and Wildlife Biology
Food Science
Forestry
Genetics
Horticulture
Microbiology
Nutritional Science
Plant Health and Protection
Professional Agriculture (off-campus)
Public Service and Administration in Agriculture
Zoology

Secondary Majors

Agricultural Extension Education
Environmental Studies
International Agriculture
Pest Management
Seed Science

A secondary major must be taken in conjunction with a primary major For *requirements of the environmental studies* program see *Index Environmental Studies*

Minors

Agricultural Biochemistry
Agricultural Education and Studies
Agricultural Systems Technology
Agronomy
Entomology
Fisheries and Wildlife Biology
Food Science
Forestry
Genetics
Horticulture
International Agriculture
Microbiology
Nutrition
Pest Management
Plant Health and Protection
Zoology

See statement on minors page 52

Certificate Programs

Agricultural Studies (winter program)

Special Nondegree Programs

General Agriculture
Preveterinary Medicine

English Proficiency

Students in the College of Agriculture are required to take 6 credits of composition (Engl 104 and 105 or higher) and 3 credits of speech fundamentals with grades of C or higher in each course and Lib 160 Students must also meet a communication-intensive requirement equivalent to 3 credits from one or more courses used to satisfy requirements of the major

Program Development

Students may use their electives to broaden their education or to strengthen an area of *specialization* Electives may be used to meet the requirements for a double major Those who wish to change their curriculum or who decide to graduate with a double major must *be enrolled for the last two semesters in the*

curriculum in which they expect to graduate Students who enroll in ROTC may apply these credits toward elective requirements

A student may wish to prepare for admission to a professional program such as law medicine, or veterinary medicine while pursuing a program toward a bachelor of science degree in the College of Agriculture This may be accomplished through several curricula however it is recommended that the student work closely with an academic adviser

Each department prepares a curriculum guide which is available to students to assist them in charting their long-term programs and to specify the exact requirements for graduation Some curricula require that students declare an area of specialization prior to being classified as seniors

Students declaring minors must include at least 15 credits for each minor

Preparation for Study in the College of Agriculture

Entrance requirements for students entering from high school or transferring with less than 24 college credits into the College of Agriculture consist of four years of English three years of mathematics which must include one year each of algebra geometry and advanced algebra three years of science which must include one year each of biology and chemistry or biology and physics or chemistry and physics and two years of social studies of which at least one year must be in American history and one semester in American government No foreign language is required for admission to the College of Agriculture

All students in the College of Agriculture are required to demonstrate proficiency in computer usage during their degree program This requirement must be met according to procedures established by the department offering the student s curriculum

Core Curriculum

All curricula in the College of Agriculture lead to a bachelor of science degree Each curriculum has specific degree requirements for graduation which include the group requirements for the College of Agriculture core curriculum

Students with a primary major in another college and taking a second major in the College of Agriculture will not be required to fulfill the core curriculum requirements of the College of Agriculture However they must fulfill all the requirements of the major including support courses

Minimum Credits	Group Requirements
9 5	**Interpersonal and public communication skills** 6 credits of composition and 3 cr of speech fundamentals with grades of C or better Lib 160 **and** A communication-intensive requirement equivalent to 3 credits from one or more courses within the major [a]
17-20	**Mathematical, physical, and life sciences** 3 credits in mathematics 3 cr of statistics, 5 cr in physical science (chemistry geological and atmospheric sciences or physics) 6 cr in life science (biochemistry biology botany ecology genetics microbiology physiology or zoology) All College of Agriculture students must demonstrate computer proficiency according to procedures established by each department
15	**Personal development, human relations, and global awareness** 3 credits in humanities 3 cr in social sciences 3 cr in ethics from an approved list 3 cr in critical thinking from an approved list (logic rhetoric semantics debate or approved course(s) within the major) 3 cr in international/ multicultural awareness course(s) from an approved list of broad-based general-sensitivity courses **and** an environmental-intensive requirement equivalent to 3 cr from one or more courses [b] **and** a problem solving intensive requirement that includes disciplinary and multi-disciplinary problems equivalent to 3 cr from one or more courses within the major [a]

Advising System

Each student in the College of Agriculture works closely with an academic adviser who is associated with the curriculum in which the student is majoring All entering students and their parents are strongly encouraged to participate in the summer orientation program in which they will have the opportunity to meet and work with academic advisers in planning their first semester schedule of classes The advisers also assist students in making personal adjustments to university life and provide helpful information on vocational choices A special effort is made by the advisers in the College of Agriculture to adjust the schedule of coursework in accordance with students interests and capabilities

Graduate Study

Graduate study in agriculture is conducted through the Graduate College Details are found in the *Graduate College* section of this catalog

[a] Communication and problem solving activities are incorporated into designated courses within each major field The communication intensive and problem solving intensive requirements are fulfilled by taking one or more of these courses The 3-credit equivalency for each of these requirements does not count toward the minimum credits needed in the group requirements

[b] The environmental intensive requirement can be met by taking courses that emphasize environmental issues either designated courses within the major field or courses from an approved list The 3-credit equivalency does not count toward the minimum credits needed in the group requirements

Various departments in the College of Agriculture also participate in the following graduate-level interdepartmental offerings

Immunobiology
Mineral Resources (interdepartmental minor)
Molecular Cellular and Developmental Biology
Genetics
Plant Physiology
Professional Agriculture
Technology and Social Change (interdepartmental minor)
Toxicology (interdepartmental major)
Water Resources (interdepartmental major)

For details consult the *Graduate College* section of this catalog

Program in Preveterinary Medicine

Students in the College of Agriculture may complete the requirements for admission to the College of Veterinary Medicine by enrolling in any curriculum within the college Because a solid foundation in the sciences is basic to the program in veterinary medicine those curricula that emphasize the sciences are usually more compatible with preveterinary medicine (see page 109 for specific requirements for admission to the College of Veterinary Medicine)

Preveterinary medicine students also have an opportunity with careful planning to complete the requirements for a bachelor of science degree in an individual curriculum within the College of Agriculture after admission to the College of Veterinary Medicine This may be done by completing the prescribed course of study established by an individual curriculum Students also may meet degree requirements of an individual curriculum through the College of Agriculture Honors Program Further details are available from an academic adviser or from members of the College of Agriculture Honors Committee

Honors Program

The College of Agriculture Honors Program provides an opportunity for high ability students to individualize their program of study See page 53 for more details

Program in General Agriculture

General agriculture is a nondegree program for undeclared majors in the College of Agriculture

Winter Program

The Agricultural Studies Winter Program is a certificate program that offers half-semester courses for three winters Requirements for admission are high school graduation and an interest in agriculture See pages 60 124 for more details

Off-Campus Programs

Agriculture coursework leading to bachelor of science and master of agriculture degrees in professional agriculture is offered to students who choose to study away from the Ames campus see *Off-Campus Credit Courses and Programs* for further information

Curriculum in Agricultural Biochemistry

Administered by the Department of Biochemistry and Biophysics

Cr	Degree Requirements
9 5	**Interpersonal and public communication skills** Engl 104 105 Sp Cm 212 Lib 160 communications-intensive requirement*
59-60	**Mathematical, physical, and life sciences** Math 165 166 265 or 266 Phys 221 222 Chem 177 177L 178 210 or 211 331 332 333A 321 322 322L Biol 201 202 201L or 202L 301 and demonstrate computer proficiency*
15	**Personal development, human relations, and global awareness** 3 cr in humanities 3 cr in social sciences from approved lists 3 cr in ethics 3 cr in critical thinking and 3 cr in international/multicultural awareness environmental-intensive requirement* problem solving intensive requirement*
9	**Agricultural sciences*** 9 cr from an approved list available in the department
13-15	**Agricultural biochemistry** B B 101 102 320 404 ,405 or 501 502 411 Students wishing research experience in agricultural biochemistry are encouraged to enroll in B B 499
19 5-22 5	**Electives**
128	**Total credits**

*See department for procedures to meet these requirements

Typical Program for the First Year

Cr	Fall
4	General Chemistry—Chem 177
1	Laboratory in General Chemistry—177L
4	Calculus I—Math 165
3	Freshman Composition—Engl 104
3	Principles of Biology—Biol 201
1	Principles of Biology Laboratory—Biol 201L
1	Introduction to Biochemical Activities—B B 101

Cr	Spring
3	General Chemistry—Chem 178
4	Calculus II—Math 166
3	Freshman Composition—Engl 105
3	Principles of Biology—Biol 202
1	Principles of Biology Laboratory—Biol 202L
1	Introduction to Biochemistry—B B 102

Curriculum in Agricultural Business

Administered by the Department of Economics Students are required to select one area of emphasis from the following economic analysis farm management agribusiness management agricultural finance agricultural sales and marketing agricultural accounting natural resources or foreign agriculture The area of emphasis is waived for students completing either a double major (other than Econ) or a minor

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 and 302 Sp Cm 212 Lib 160 communications-intensive requirement*
26	**Mathematical, physical, and life sciences** Math 150 151 Stat 227 Chem 163-163L Com S 103 Biol 109 biological sciences electives (0-3 cr)
15	**Personal development, human relations, and global awareness** Electives in history philosophy anthropolgy religious studies music theatre English art (3 cr) electives in sociology political science psychology (3 cr) electives in ethics* (3 cr) critical thinking* (3 cr) international/multicultural awareness* (3 cr) environmental-intensive requirement*
40	**Economics and business** Econ 110 192 205 206 301 302 330 335 447 451 Acct 284 285 Fin 350
9	**Agricultural sciences** Agron 114 An S 114 agricultural science electives* (3 cr)
8-11	**Area of emphasis** Must include 3 cr problem-solving-intensive requirement*
14 5-17 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements

Typical Program for the First Year

Cr	Fall
R	Orientation in Agricultural Business—Econ 110
4	Agribusiness Operations—Econ 192
3	Principles of Crop Production—Agron 114
3	Mathematics for Business and Social Sciences I —Math 150
3	Freshman Composition—Engl 104
3	Introductory Biology—Biol 109

Cr	Spring
5	General Chemistry—Chem 163 163L
3	Survey of the Animal Industry—An S 114
3	Mathematics for Business and Social Sciences II—Math 151
3	Freshman Composition—Engl 105
3	Microeconomics—Econ 206

Preprofessional Studies

Agricultural business provides preparation for advanced studies in law economics agricultural economics and business

Curriculum in Agricultural Education

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 Lib 160 Engl 302 speech elective (3 cr) communication-intensive requirement**
20	**Mathematical, physical, and life sciences** Chem 163 163L or 177 177L BB 221 Stat 104 Biol 109 Math 104 or 150 life science elective (3 cr) demonstration of computer proficiency**
18	**Personal development, human relations, and global awareness** Psych 230 333 American history elective (3 cr) from approved lists 3 cr in ethics 3 cr in critical thinking and 3 cr in international/multicultural awareness environmental-intensive requirement** problem solving requirement**
1	**Physical education** Elective selected from PE dance health and/or safety
34	**Agricultural sciences and economics** Agron 114 An S 114 AST electives (3 cr) horticulture elective (2 cr) Econ 201 or 330 Acct 284 AgEdS 450 electives (9 cr)
22	**Professional credits** Select from SecEd 204* 30* 406* 415* 426* AgEdS 110** 211* 310* 311 315 410* 411* 412 (8 cr) 417 (12 cr)*
21 5	**Free electives**
128	**Total credits**

*Required for certification

**See department for procedures to meet requirements

Typical Program for the First Year

Cr	Fall
3	Freshman Composition—Engl 104
3	Introduction to Probability and Matrices—Math 104 or Discrete Mathematics for Business and Social Sciences—Math 150
2	Horticulture elective
3	Introductory Biology—Biol 109
R	Orientation to Agricultural Education and Studies—AgEdS 110A
0 5	Library Instruction—Lib 160
3	American history elective

Cr	Spring
3	Freshman Composition—Engl 105
3	Survey of the Animal Industry—An S 114
3	Foundations of American Education—SecEd 204
3	Developmental Psychology—Psych 230
3	Principles of Economics—Econ 201

Curriculum in Agricultural Extension Education

Administered by the Department of Agricultural Education and Studies Agricultural extension education may be taken only as a secondary major in a double major program

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 302 speech elective (3 cr) Lib 160 communication-intensive requirement*
20	**Mathematical, physical and life sciences** Chem 163 163L or 177 177L Math 104 or 150 Stat 104 B B 221 Biol 109 entomology elective (3 cr) demonstration of computer proficiency *
18	**Personal development, human relations, and global awareness** Psych 230 from approved lists 3 cr in ethics 3 cr in critical thinking and 3 cr in international/multicultural awareness humanities electives (6 cr) environmental-intensive requirement * problem-solving requirement*
35	**Agricultural sciences and economics** Animal science electives (6 cr) agronomy electives (9 cr) economics elective (3 cr) *horticulture elective (2 cr)* electives (14 cr)
34	**Professional credits** AgEdS 110A 211 310 311, 315, 414 418 (8 cr)
24 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirement

Typical Program for the First Year

Because agricultural extension education is a secondary major that has requirements that are similar to those of the agricultural education major courses taken by the student during the first year will be similar to those taken by first-year agricultural education majors Differences in individual programs will reflect the student s choice of a primary major

Curriculum in Agricultural Studies

Administered by the Department of Agricultural Education and Studies The curriculum in agricultural studies includes a four-year bachelor of science degree program and a collegiate-level winter certificate program

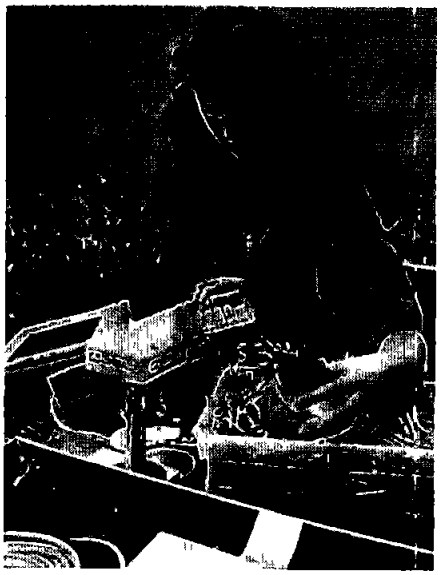
Cr	Degree Requirements (4-year degree)
12 5	**Interpersonal and public communication skills** Engl 104 105 and 302, speech elective (3 cr) Lib 160 communications-intensive requirement*
20	**Mathematical, physical, and life sciences** Chem 163 163L or 177 177L Math 104 or 150 Stat 104 Biol 109 life science elective (3 cr) B B 221 demonstration of computer proficiency*
19	**Personal development, human relations, and global awareness** Econ 201 or 205 and 206 humanities electives (3 cr) AgEdS 315 from approved lists 3 cr in ethics 3 cr in critical thinking and 3 cr in international/multicultural awareness environmental-intensive requirement * problem-solving requirement*
46 5	**Agricultural sciences and economics** AgEdS 110B 215 415 450 Agron 114 154 212 An S 114 218 electives (3 cr) Econ 330, 335 AST electives (3cr) electives (3 cr) credits 300-level or above to be chosen from agricultural systems technology agronomy animal science, agricultural economics forestry and horticulture (6 cr) Acct 284
31	**Free electives**
128	**Total credits**

*See department for procedures to meet requirement

Typical Program for the First Year

Cr	Fall
R	Orientation to Agricultural Studies—AgEdS 110B
3	Survey of the Animal Industry—An S 114
3	Introduction to Probability and Matrices—Math 104 or Discrete Mathematics—Math 150
3	Freshman Composition—Engl 104
2	Agricultural systems technology elective
3	Introductory Biology—Biol 109
0 5	Library Instruction—Lib 160

Cr	Spring
3	Principles of Crop Production—Agron 114



3-4	Principles of Economics—Econ 201 or 205
5	General Chemistry—Chem 163 163L
3	Freshman Composition—Engl 105

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the agricultural studies curriculum

Winter Program in Agricultural Studies

Certificate Requirements

Cr	First Winter
	Agriculture Seminar—AgEdS 102
3	Animal Production—An S 101
2	Crop and Soil Fundamentals—Agron 142
2	Farm Business Practices—Econ 130
21	Microcomputers in Production Agriculture—AST 185

Cr	Second Winter
1	Agriculture Seminar—AgEdS 102
1	Electrical Power—AST 160
1	Confinement Systems for Livestock Production—AST 173
2	Soil and Crop Management—Agron 144
2	Farm Financial Analysis and Tax Management—Econ 131
2	Problem-solving and Decision-making—AgEdS 115

Cr	Third Winter
1	Agriculture Seminar—AgEdS 102
2	Grain Crop Management—Agron 146
2	Beef and Swine Feeding—An S 102
2	Agricultural Marketing for Farm Operations—Econ 135
2	Agricultural Technology Management—AST 158
27	**Total credits**

Curriculum in Agricultural Systems Technology

Administered by the Department of Agricultural and Biosystems Engineering A minor in agricultural systems technology is available the requirements appear under *Agricultural Systems Technology Courses and Programs*

Cr	Degree Requirements
12 5	**Communications** Engl 104 105 Sp Cm 212 Engl 302 or 314 or Sp Cm 312 Lib 160 and communications-intensive requirement*
27-29	**Mathematical, physical, and life sciences** Math 165 or both 140 and 142 Stat 104 Chem 163 163L Phys 111 or 106 AST 181 281 Biol 109 B B 221
18	**Personal development, human relations, and global awareness** Humanities elective (3 cr) Econ 205 206 from approved lists 3 cr in ethics 3 cr in critical thinking 3 cr in international/ multicultural awareness and environmental-intensive requirement*
6	**Agricultural sciences** Select from department-approved list
32	**Agricultural systems technology** AST 110 403 496 a minimum of 30 cr from the following AST 191 233 324 326 330 335 358 360 362 425 430 435 464 473 475 476 490 and problem solving-intensive requirement*
3	**Other required courses** Acct 284
18	**Specialization options** **Production** Credits selected from department-approved list of agricultural science courses **Agribusiness Management** Credits selected from department-approved list **Grain operations** AST 464 Econ 335 441 a minimum of 9 credits from the following Acct 285 AnS 218 Econ 301 or 304 Ent 376 Mgmt 370 Mkt 340 TrLog 360 460 **Applied Technology** Select credits with adviser assistance for specialization in one of these areas water quality safety seed science construction engineering machine testing food processing environment computer operations international studies
9 5-11 5	**Free electives**
128	**Total credits**

Typical Program for the First Year

Cr	Fall
R	Orientation in Agricultural Systems Technology—AST 110
2	Principles of Agricultural Systems Technology—AST 191
3	Fundamentals of Algebra—Math 140
3	Freshman Composition—Engl 104
5	General Chemistry—Chem 163 163L
3	Agricultural science elective
Cr	**Spring**
3	Microcomputer Applications in Agriculture—AST 181
3	Introductory Biology—Biol 109
3	Freshman Composition—Engl 105
3	Trigonometry and Analytic Geometry—Math142
3	Agricultural science elective
0 5	Library Instruction—Lib 160

Curriculum in Agronomy

Students majoring in agronomy study crop science soil science and agricultural meteorology in one of three options (1) management and technology (2) environmental science (3) science

Management and Technology Option

Cr	Degree Requirements
12 5	**Communications** Engl 104 105 Lib 160 Sp Cm 212 or AgEdS 311 electives* (3 cr) communications-intensive requirement*
9	**Mathematical sciences** Math 140 Stat 104 Com S*
16	**Physical sciences** Chem 163 163L 231 232 Geol 100 Phys 106
17-19	**Biological sciences** Biol 201 202 301 Bot 310 *select two additional courses* from B B 301 Bot 207 Ent 376 MIPM 202 or PI HP 407
15	**Personal development, human relations, and global awareness** 3 cr each from humanities social sciences ethics critical thinking and international/ multicultural awareness * environmental-intensive requirement * problem-solving intensive requirement*
35	**Agronomic sciences** Agron 104 105 110 114 154 206 211 318 354 354L and 411 and 17 cr of electives (no more than 2 cr total from Agron 331 371 490 491 and 496 allowed to meet the 17-cr requirement) (A minimum of 15 credits in agronomy must be earned at Iowa State)
21 5-23 5	**Free electives**
128	**Total credits**

Environmental Science Option

Cr	Degree Requirements
12 5	**Communications** Engl 104 105 314 Lib 160 Sp Cm 212 or AgEdS 311 communication intensive requirement*
9-10	**Mathematical sciences** Math 140 Stat 101 or 104 Com S*
19	**Physical sciences** Chem 163 163L 231 232 Geol 100 103 Phys 106
17-18	**Biological sciences** Biol 201 202 Bot 310 MIPM 202 select one additional course from A Ecl 231 410 Biol 301 312 B B 301 Bot 207 Ent 376 or PI HP 407
15	**Personal development, human relations, and global awareness*** 3 cr each from humanities social sciences ethics critical thinking and international/ multicultural awareness * environmental-intensive requirement * problem-solving intensive requirement*
35	**Agronomic sciences** Agron 104 105 110 114 154 206 211 318 354 354L 411 485 and 14 cr from Agron 212 334 340 364 404 445 456 or 473 (A minimum of 15 cr in agronomy must be earned at Iowa State)
9	**Environmental science *electives*** Select 9 credits from Env S 223 293 324 380 382 404 425 482 491 Agron 364 445 AST 233 324 425 475 Biol 312 or Bot 405
9 5-11 5	**Free electives**
128	**Total credits**

*See department for procedures to meet these requirements

Science Option

The science option is recommended for individuals who want a stronger basic science orientation See an agronomy adviser for specific recommendations

Typical Program for the First Year

Cr	Fall
R	Orientation in Agronomy—Agron 110
3	Introduction to Meteorology—Agron 206
3	Principles of Crop Production—Agron 114
5	General Chemistry—Chem 163 and 163L
3	Freshman Composition—Engl 104
0 5	Library Instruction—Lib 160
Cr	**Spring**
3	Fundamentals of Soil Science—Agron 154
3	Principles of Biology—Biol 201
3	Freshman Composition—Engl 105
3	The Earth—Geol 100
3	Computer science elective

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the agronomy curriculum

Curriculum in Animal Ecology

An area of specialization must be selected upon consultation with academic adviser

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 105 Sp Cm 212 Lib 160 and two additional 3-cr courses in written or oral communication from an approved list and a communications-intensive requirement*
10-12	**Mathematical sciences** Math 140 and 141 or 142 and 160 or 165 Stat 104
3	**Computer science or computer applications**
20	**Physical sciences** Chem 163 163L 164 (or 177 177L 178) 231 232 Phys 111 112
3-4	**Meteorology and earth sciences** Agron 206 or 154 or Geol 100
37-38	**Biological sciences** A Ecl 110 231 320 320L 410 Biol 201 201L 202 202L 303 312 Bot 484 and one additional approved Bot course * Gen 320 or Biol 301 Zool 355 or 459 an approved seminar course
15	**Personal development, human relations and global awareness** 3 cr in humanities 3 cr in social sciences and from approved lists 3 cr in ethics 3 cr in critical thinking and 3 cr in international/multicultural awareness and environmental-intensive* and problem solving intensive* requirements
15	**Area of specialization (approved courses)**
R	Practical experience requirement* (A Ecl 104)
8 5-12 5	**Free electives**
128	**Total Credits**

*See department for procedures to meet requirements

Typical Program for the First Year

Cr	Fall
4	Principles of Biology—Biol 201 201L
R	Orientation in Animal Ecology—A Ecl 110
3	Freshman Composition—Engl 105
3	Fundamentals of Algebra for Science and Higher Mathematics—Math 140
3	Humanities or social sciences elective
3	Elective

Cr	Spring
3	Introduction to Conservation Biology—A Ecl 231
5	General Chemistry—Chem 163 163L
3	Communications elective
2	Trigonometry—Math 141
4	Principles of Biology—Biol 202, 202L
0 5	Library Instruction—Lib 160

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the animal ecology curriculum

Curriculum in Animal Science

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 204 or 302 or 314 Sp Cm 212 Lib 160 and communications-intensive requirement
6-8	**Mathematical sciences** Math 150 Stat 101 or 104 or 227
8	**Physical sciences** Chem 177 177L B B 221 or organic chemistry (3 cr)
17-19	**Biological sciences** Biol 201 201L 202 202L or VPP 229 or Zool 155 156 Biol 301 MIPM 202 one course from the following Agron 114 154 Bot 207 Hort 221 and an environmental-intensive requirement*
15	**Personal development, human relations, and global awareness** 3 credits in humanities 3 cr in social sciences from approved lists 3 cr in ethics 3 cr in critical thinking 3 cr in international/multicultural awareness and 3 cr in problem solving-intensive requirement*
29-31	**Animal science** An S 110 114 214 224 or 270 318 319 331 352 two different commodity areas from the following courses 413-417 (3 modules minimum) 420 or 423 425 426 429 434 or 436 470
10-13	**Business** Acct 284 Com S 103 or 107 Econ 201 or 205 and 206
23 5-30 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements

Typical Program for the First Year

Cr	Fall
R	Orientation in Animal Science—An S 110
3	Survey of the Animal Industry—An S 114
3	Principles of Biology—Biol 201
1	Laboratory in General Biology—Biol 201L
3	Freshman Composition—Engl 104
0 5	Library Instruction—Lib 160
3	Mathematics—Math 150
3	Elective

Cr	Spring
3	Agron 114 or biological science elective
4	General Chemistry—Chem 177
1	Laboratory in General Chemistry—Chem 177L
3	Freshman Composition—Engl 105
3	Introduction to Statistics—Stat 104
3	Elective

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the animal science curriculum

Curriculum in Dairy Science

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104, 105 Sp Cm 212 Lib 160 electives from approved list (3 cr) and communications intensive requirement*
6	**Mathematical Sciences** Math 150 Stat (3 cr)
8	**Physical Sciences** Chem 177 177L B B 221 or Chem 331
17-19	**Biological Sciences** Biol 201 201L 202 202L or VPP 229 or Zool 155 156 Biol 301 MIPM 202 or FS HN 273 one course from the following Agron 114 154 Bot 207 Hort 221 and environmental-intensive requirement
15	**Personal development, human relations, and global awareness** 3 cr in humanities social sciences (Econ 201 or 205 3 cr) from approved lists 3 cr in ethics critical thinking (Econ 206), 3 cr in international/multicultural awareness and problem solving-intensive requirement*
36-37	**Professional dairy science** An S 110 114 214 318 319 331 352 434 436 Acct 284 Com S 103 or 107 or AST181 Econ 330
30 5-33 5	**Free electives**
128	**Total Credits**

Typical Program for the First Year

Cr	Fall
R	Orientation in Dairy Science—An S 110
3	Survey or the Animal Industry—An S 114
3	Principles of Biology—Biol 201
1	Laboratory in General Biology—Biol 201L
3	Freshman Composition—Engl 104
0 5	Library Instruction—Lib 160
3	Mathematics—Math 150
3	Elective

Cr	Spring
3	Agron 114 or biological science elective
4	General Chemistry—Chem 177
3	Freshman Composition—Engl 105
3	Introduction to Statistics—Stat 104
3	Elective

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the dairy science curriculum

Curriculum in Dietetics

Administered by the Department of Food Science and Human Nutrition and available to students in both the College of Agriculture and the College of Family and Consumer Sciences

Option 1 General Dietetics

The student is prepared for admission to dietetic internship programs and other professional experience programs approved/accredited by The American Dietetic Association Courses included have been approved as meeting the academic requirements of the American Dietetic Association There is a $25 fee for a statement of verification of completion of the approved program

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 FCEdS 310 Jl MC 205 or 3-credit written English Lib 160 Sp Cm 212 communications-intensive requirement*
35-37	**Mathematical , physical, and life sciences** 3 cr college-level math Stat 101 or 104 demonstration of computer literacy * Chem 163 163L 231 232 B B 301 311 Biol 201 201L MIPM 202 Zool 155 156 select from Biol 202 or 202 and 202L or Gen 260
22	**Personal development, human relations and global awareness**** Econ 201 HDFS 102 or Psych 230 Psych 101 Soc 134 3 cr in ethics * 3 cr in international/ multicultural awareness * 3 cr in humanities
44	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 FS HN 167 203 214 260 360 360L 403 411 461 463 466 480 H R I 380 380L 391 392 environmental-intensive component * problem solving component*
12 5-14 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements College of Agriculture critical thinking requirement met by Psych 101

**A student who has not had high school civics is required to take Pol S 215

Option 2 Coordinated Undergraduate Program

The coordinated undergraduate program integrates academic study with clinical experience so that graduates are eligible to take the national registration examination in dietetics upon completion of the baccalaureate degree The program is accredited by the American Dietetic Association Planning for this option should begin in the freshman year Application for admission is usually made during the sophomore year and applicants must have a cumulative grade point average of 2 5 Enrollment is limited by the availability of clinical facilities There is a program fee of $15 for the junior year and $25 for the senior year

Cr	Degree Requirements
9 5	**Interpersonal and public communication skills** Engl 104 105 FCEdS 310 Lib 160 Sp Cm 212 communications-intensive requirement*
32-33	**Mathematical, physical, and life sciences** 3 cr college level math Stat 101 or 104 demonstration of computer literacy * Chem 163 163L 231 232 B B 301 311 Biol 201 201L MIPM 202 Zool 155 156
22	**Personal development, human relations, and global awareness**** Econ 201 HDFS 102 or Psych 230 Psych 101 Soc 134 3 cr in ethics * 3 cr in international/ multicultural awareness * 3 cr in humanities
64	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 FS HN 167 203 214 260 340 360 360L 411 440 441 442 443 445 461 463 466 480 H R I 380 380L 391 392 436 environmental-intensive component * problem-solving component*
0 0 5	**Free elective**
128	**Total credits**

*See department for procedures to meet requirements College of Agriculture critical thinking requirement met by Psych 101

**Students who have not had high school civics are required to take Pol S 215

Option 3 Dietetics and Specialized Studies

This option is for students who are interested in combining the study of dietetics with that of exercise science or international studies Courses listed immediately below include those that meet the academic requirements of the American Dietetic Association Additional courses for the areas of specialization are as approved by the Department of Health and Human Performance and the Family and Consumer Sciences International Studies Committee respectively Total credits required for graduation will depend upon which of the specialized areas of study is selected The student is prepared for admission to dietetic internship programs and other professional experience programs approved/accredited by the American Dietetic Association There is a $25 fee for a statement of verification of completion of the approved program

Option 3 is available only as a double degree in dietetics and exercise science or a double major with international studies in home economics

Cr	Degree Requirements
9 5	**Interpersonal and public communication skills** Engl 104 105 FCEdS 310 Lib 160 Sp Cm 212 communication-intensive requirement*
27-28	**Mathematical, physical, and life sciences** 3 cr college-level math Stat 101 or 104 demonstration of computer literacy * Chem 163 163L 231 232 B B 301 Biol 201 MIPM 202 Zool 155
22	**Personal development, human relations, and global awareness**** Econ 201 HDFS 102 or Psych 230 Psych 101 Soc 134 3 cr in ethics * 3 cr in international/multicultural awareness * 3 cr in humanities
39	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 FS HN 203 214 260 360 360L 411 461 463 466 480 H R I 380 380L 391 392 environmental-intensive component * problem-solving component*
29 5-30 5	**Free Electives*****
128	**Total credits**

*See department for procedures to meet requirements College of Agriculture critical thinking requirement met by Psych 101

**Students who have not had high school civics are required to take Pol S 215 For international studies double major a minimum of two years university level proficiency in one foreign language is required

***For double major in international studies in home economics (option under Curriculum in Studies in Family and Consumer Sciences) 44-45 additional credits are required For double degree in exercise science (option under Curriculum in Physical Education) 74-75 additional credits required Some of these credits can be used as free electives in the dietetics degree requirements

Curriculum in Entomology

Cr	Degree Requirements
12 5	**Communications** Engl 104 105 314 or 204 Sp Cm 212 Lib 160 and communications-intensive requirement*
50-51	**Mathematical, physical, and life sciences** Math 140 Stat 104 Chem 163 163L 164 231 and 232 Phys 106 Agron 206 Biol 201 201L 202 202L 301 301L 302 302L 312 MIPM 202 Zool 355 or Bot 310 and demonstration of computer proficiency *

15	**Personal development, human relations, and global awareness** Econ 201 3 cr in humanities, from approved list 3 cr in ethics 3 cr in critical thinking 3 cr in international/multicultural awareness and environmental-intensive requirement * and problem solving-intensive requirement*
10	**Agricultural sciences** Agron 114 or An S 114 or Hort 221 electives (from approved list*)
19	**Entomology** Ent 110 211, 370 376 Ent 490 or P M 491 Ent electives
19 5-20 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements and for approved course lists

Typical Program for the First Year

Cr	Fall
3	Freshman Composition—Engl 104
3	Principles of Biology—Biol 201
1	Laboratory in Principles of Biology—Biol 201L
4	General Chemistry—Chem 163
1	Laboratory in General Chemistry—Chem 163L
3	Insects and Society—Ent 211
R	Orientation in Entomology—Ent 110

Cr	Spring
3	Freshman Composition—Engl 105
3	General Chemistry—Chem 164
4	Principles of Biology—Biol 202 202L
3	Computer Science—Com S 103
3	Principles of Crop Production—Agron 114 or Survey of the Animal Industry—An S 114 or Principles of Horticulture—Hort 221
0 5	Library Instruction—Lib 160

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the entomology curriculum

Curriculum in Fisheries and Wildlife Biology

Administered by the Department of Animal Ecology The curriculum provides training in both fisheries and wildlife biology Students may pursue special interests through elective courses and summer employment A minor in fisheries and wildlife biology is available the requirements appear under *Animal Ecology Courses and Programs*

An area of specialization must be selected upon consultation with academic adviser

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 105 Sp Cm 212 Lib 160 and two additional 3 cr courses in written or oral communications from an approved list and a communications-intensive requirement*
6-8	**Mathematical sciences** Math 140 and 141 or 142 Stat 104
3	**Computer science or computer applications**
15-16	**Physical sciences** Chem 163 163L 164 (or 177 177L 178) Phys 111 and 112 or Phys 106 and one of the following Agron 154 Geol 100 or Chem 231 and 232
35-36	**Biological sciences** A Ecl 110 320 320L 410 10 credits from 321 322 323 324 Biol 201 201L 202, 202L 312 two approved botany courses * an approved seminar course
13	**Fisheries and wildlife management** A Ecl 231 350 440 441 and 451
15	**Personal development, human relations, and global awareness** 3 cr in humanities 3 cr in social sciences and from approved lists 3 cr in ethics 3 cr in critical thinking and 3 cr in international/multicultural awareness and environmental-intensive* and problem solving-intensive* requirements
15	**Area of specialization (approved courses)**
R	Practical experience requirement* (A Ecl 104)
10 5-15 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements

Typical Program for the First Year

Cr	Fall
4	Principles of Biology—Biol 201 201L
R	Orientation in Animal Ecology—A Ecl 110
3	Freshman Composition—Engl 105
3	Fundamentals of Algebra for Science and Higher Mathematics—Math 140
3	Humanities or social science elective
3	Elective

Cr	Spring
3	Introduction to Conservation Biology—A Ecl 231
5	General Chemistry—Chem 163 163L
3	Communications elective
2	Trigonometry—Math 141
4	Principles of Biology—Biol 202 202L
0 5	Library Instruction—Lib 160

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the fisheries and wildlife biology curriculum

Curriculum in Food Science

Administered by the Department of Food Science and Human Nutrition and available to students in both the College of Agriculture and the College of Family and Consumer Sciences

Option 1 Food Science and Technology

Cr	Degree Requirements
9 5	**Interpersonal and public communication skills** Engl 104 105 FCEdS 310 Lib 160 CmStd101 or 102 or Sp Cm 212 communications-intensive requirement*
49-56	**Mathematical, physical, and life sciences** Com S 103 or equivalent Math 165 166 Stat 101 or 104 Chem 163 163L 164 164L 211 or 177 177L 178 Chem 331 332 333A Phys 111 112 B B 301 Biol 201 201L MIPM 202 202L
18	**Personal development, human relations, and global awareness** HD FS 102 or Psych 230 3 cr in ethics * 3 cr in international/multicultural awareness * 6 cr in humanities and/or social science to total 9 in each category
40	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 FS HN 203 311 360 403 410 420 421 451 471 472 480 + additional FS HN courses at the 200 level or above to total 40 credits problem solving component * environmental-intensive component*
4 5-11 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements College of Agriculture critical thinking requirement met by Psych 230

Option 2 Food Science and Industry

Cr	Degree Requirements
15 5	**Interpersonal and public communication skills** Engl 104 105 FCEdS 310 Lib 160 Sp Cm 212 communications-intensive requirement * + 6 credits from approved list
34-36	**Mathematical, physical, and life sciences** Com S 103 or equivalent Math 104 or above (150 recommended) Stat 101 or 104 Chem 163 163L 231 232 Phys 106 B B 301 Biol 201 201L MIPM 202 202L

26-28	**Personal development, human relations, and global awareness** Econ 205 206, HD FS 102 or Psych 230 3 cr in humanities 3 cr in ethics * 3 cr in international/multicultural awareness * 1 course from each group Acct Econ 304 or any Acct course Mgmt Econ 404 I E 375 Mgmt 235 370 371 Soc 264 380 420, Mkt Econ 301 335 338 Mkt 340 341 410 442 444 447
40	**Food science and human nutrition** *FS HN 110 or FCEdS 110 or* 210 FS HN 202 203 311 360 403 405 410 420 421 471 472 480 + additional courses at the 200 level or above to total 40 credits environmental-intensive component * problem-solving component*
8 5-142	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements College of Agriculture critical thinking requirement met by Econ 205

Option 3 Consumer Food Science

Cr	Degree Requirements
21 5	**Interpersonal and public communication skills** Engl 104 105 302 or 314 FCEdS 310 Jl MC 205 330 Lib 160 Sp Cm 212 312 communications-intensive requirement*
33-35	**Mathematical, physical, and life sciences** 3 cr college-level math Com S 103 or equivalent Stat 101 or 104 Chem 163 163L 231 232 B B 301 Biol 201 201L MIPM 202 202L Zool 155
22	**Personal development, human relations, and global awareness** Econ 201, HD FS 102 or Psych 230 Mkt 340 447 3 cr in ethics * 3 cr in international/multicultural awareness * 3 cr in humanities
40	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 FS HN 203 214 260 or 461 or 463 304 311 or B B 311 360 403 411 412 471 480 + courses from the following to total 40 credits FS HN 403 405 416 419 420 421 HRI 380 380L environmental-intensive component * problem-solving component*
9 5-11 5	**Free electives**
128	**Total credits**

*See department for procedure to meet requirements College of Agriculture critical thinking requirement met by Psych 230

Curriculum in Forestry

Cr	Degree Requirements
12 5	**Interpersonal and public communications skills** Engl 104 105 Lib 160 Sp Cm 212 Engl 314
24	**Mathematical, physical and life sciences** Math 140 150 Stat 104 Chem 163 163L Biol 109 Bot 207 256 and demonstration of computer proficiency*
19	**Personal development, human relations, and global awareness** 3 cr in humanities Soc 130 or Pol S 215 Econ 201 3 cr in ethics * 3 cr in critical thinking * and 3 cr in international/multicultural awareness * environmental-intensive requirement * problem-solving intensive requirement*
37	**Forestry courses** For 101 104 110 201 202 203 204 205 206 280 281 302 451 452 453 454

Students majoring in forestry are required to choose one of the following options at the end of their sophomore year forest resource *management or forest products*

Options

Cr	
35 5	**Forest products** For 481 483 485 486 487 488 electives
35 5	**Forest resource management** For 301 342 445 Pl P 416 6 credits in multiple use courses*
128	**Total credits**

*See department for procedures to meet requirements

Typical Program for the First Year

Cr	Fall
3	Freshman Composition—Engl 104
2	Introduction to Forestry—For 101
R	Orientation in Forestry—For 110
0 5	Library Instruction—Lib 160
3	Fundamentals of Algebra—Math 140
3	Rural Institutions and Organization—Soc 130 or American Government Institutions and Policies—Pol S 215
3	Introductory Biology—Biol 109

Cr	Spring
4	General Botany—Bot 207
3	Introduction to Statistics—Stat 104
3	Discrete Mathematics—Math 150
3	Freshman Composition—Engl 105
3	Wood Anatomy and Properties—For 280

Curriculum in Genetics

Administered by the Department of Zoology and Genetics

Cr	Degree Requirements
12 5	**Communications** Engl 104 105 314 an advanced English writing course (Engl 201 302-316) oral communication (AgEdS 311 Sp Cm 212 Thtre 151, Lib 160
11	**Math** Must include at least one course from both calculus and statistics chosen from Math 160 161 165 166 175 176 Stat 101 or 104 401 402 403
3	**Computer Studies** Three credits in computer science or computer applications chosen from an approved list See department for list
31	**Physical sciences** Chem 177 177L 178 178L (or 211) 331 332 333 334 B B 404 or 420 Chem 211 or 321 or B B 405 or 411 Physics 111 112 or 221 222
23	**Biological sciences** Biol 201 201L 202 202L 301 301L 302 302L MIPM 202 Biol 403
15	***Personal development, human relations, and global awareness*** 15 credits including 3 credits each in the humanities social sciences ethics critical thinking and international/cultural awareness chosen from an approved list The environment-intensive and problem solving-intensive college requirements can be satisfied by selection of appropriate departmental courses See department for list of rules
9	**Genetics** Gen 110 410 411 460 or 462 491
12	**Support electives** Choose 12 credits from any lecture or lab course numbered 300 or above taught by the following departments B B Botany MIPM Zoology and Genetics Choose Hort 425 or Agron 421 or An S 352 A total of 3 credits of 490 from B B Botany MIPM Zoology or Genetics may be used in the major See department for requirements **Electives** Additional electives sufficient to equal the 128 credits required for graduation
128	**Total credits**

Typical Program for the First Year

Cr	Fall
5	General Chemistry—Chem 177 177L
3	Freshman Composition—Engl 104
4	Calculus—Math 165
4	Principles of Biology—Biol 201 201L
0	Orientation and Career Opportunities—Gen 110
5	Library Instruction—Lib 160

Cr	Spring
4	General Chemistry—Chem 178 178L
3	Freshman Composition—Engl 105
4	Calculus—Math 166
4	Principles of Biology—Biol 202 202L

Curriculum in Horticulture

Students majoring in horticulture will select an option in which to specialize prior to reaching junior standing and will fulfill the requirements described below under *Specialization Options*

A minor is available The requirements appear under *Horticulture Courses and Programs*

Cr	Degree Requirements
9 5	**Interpersonal and Public Communication Skills** Engl 105 302 or 314 Lib 160 Sp Cm 212 and a communications-intensive requirement equivalent to 3 credits from one or more courses within the major
6-9	**Mathematical sciences** Math 140 or 150 or 165 and Stat 101 or 104 or 227
13	**Physical sciences** Chem 163 163L 231 232A and Chem 164 164L or Phys 106 or 111
19-20	**Biological sciences** Biol 201 202 Bot 310 or 320 and 9-10 credits from the following group Agron 317 354 Bot 306 404 Biol 301 312 Gen 330 Ent 370 or 376, Pl HP 407 For 416
18	**Personal development, human relations, and global awareness** Hort 498 and one 3 credit course from each of the following areas humanities ethics critical thinking social science and international/ multicultural awareness
3	**Soil sciences** Agron 154
30-32	**Horticultural sciences** Hort 110 221 420 and 24-26 credits from the following list (up to 4 credits of Hort 490 and up to 3 credits of Hort 391 may be used to satisfy horticultural sciences requirements) Hort 233 241 322 332 332L 338 342 344 351 351L 422 423, 424 425 433 434, 442 451 461 471 and an environmental-intensive requirement equivalent to 3 credits from one or more courses within the major
12	**Specialized options** **Production and business management** Acct 284 and 9 or more credits from the following group Acct 215 285 AST 358 Agron 206 Com S 103 or 107 or AST 181 Econ 201 or 205 206 330 Mgmt 370 Mkt 340 341 442 446 447 **Science** B B 301 or 404 Math 166 and 5 or more credits from the following group B B 311 404 405 411 Bot 403 Chem 210 211 312 324 325L 331 332 333A or 333B or 334A or 334B Gen 330 420 430 Com S 107 or 205 or 211 Math 166 Phys 112 **Turfgrass management** Acct 284 and 9 or more credits from the following group Acct 285 AST 257 324 326 358 385 Agron 206, 340 453 457 Com S 103 or 107 or AST 181 HRIM 287 Mgmt 370 Other courses may be substituted with permission by those interested in specialized areas of turfgrass management
11 5-17 5	**Electives**
128	**Total credits**

An official minor will be accepted in place of a specialized option with the permission of the student s adviser

Typical Program for the First Year

Cr	Fall
3	General Biology—Biol 201
5	General Chemistry—Chem 163 163L
3	Freshman Composition—Engl 105
R	Orientation in Horticulture—Hort 110
0 5	Library Instruction—Lib 160
3	Fundamentals of Algebra for Science and Higher Mathematics—Math 140
1-3	Elective

Cr	Spring
3	General Biology—Biol 202
4	General Chemistry—Chem 164 164L (or Phys 106 or 111)
3	Humanities or social science from an approved list
3	Principles of Horticulture—Hort 221
1-3	Elective

Curriculum in International Agriculture

Administered by the International Agricultural Programs Office International agriculture can be taken only as a secondary major in conjunction with a primary major in the College of Agriculture A minor is available to interested students regardless of their major

Cr	Degree Requirements**
12 5	**Interpersonal and public communication skills** Engl 104 105 Sp Cm 212 Lib 160 electives (3 cr) and communications-intensive requirement*
19	**Mathematics , physical , and life sciences** Math 140 Chem 163 163L math or physical science electives (5 cr) biological sciences electives (6 cr) and demonstration of computer proficiency*
37	**Personal development, human relations, and global awareness** Soc 130 or 134 411 Econ 201 306 or 411 Pol S 241 422 481 T SC 341 or 442 Jl MC 476 Anthr 201 306 3 cr in ethics * 3 cr in critical thinking * environmental-intensive requirement * and problem solving-intensive requirement*
8	**Languages** One year of a foreign language or a minimum of four months study abroad in an accredited program or proficiency at FSI R2+ S2+
15	**International courses** Select a minimum of 15 credits from Agron 114 206 241 406 415 483 Env S 223 324 A Ecl 231 An S 495 496 or Agron 495 496 Econ 447
36 5	**Primary major requirements and free electives**
128	**Total credits**

*See department of primary major for procedures to meet core requirements

**Additional prerequisites may be required for some of the courses listed Check with your adviser

Program for the First Year

Because international agriculture is a secondary major the courses taken by the student during the first year will vary depending on the primary major (see typical program for the primary major)

Curriculum in Microbiology

Administered by the Department of Microbiology Immunology and Preventive Medicine

Cr	Degree Requirements
9 5	**Interpersonal and public communication skills** Engl 104 105 Lib 160 Sp Cm 212 communications-intensive requirement*
3	**Computer science or computer applications** Select from AST 181 Com S 103 Engr 160 IEd T 216 SecEd 101

Cr	
7	**Mathematical sciences** Stat 101 or 104 required Math 141 and 142 or 160 or 165 and 166 (recommended)
29	**Physical sciences** Chemistry minimum of 8 credits in general chemistry with at least one laboratory course minimum of 4 credits in organic chemistry (Chem 331 332 333A 334A recommended) Biochemistry minimum of 5 credits B B 404 405 (recommended) or B B 301 or Biol 302 and B B 311 or 420 Physics 8 credits from Phys 111 112 221 222
11	**Biological sciences** Biol 201 201L 202 202L and 301 or Gen 330
15	**Personal development, human relations, and global awareness** Minimum of 3 credits each in courses in humanities and social sciences Also 3 credits each in ethics critical thinking and international/multicultural awareness courses selected from approved college lists Environmental-intensive requirement * problem solving-intensive requirement *
35	**Microbiology** Required MIPM 202 202L 310 320 402 408 450 475 minimum of 4 credits selected from the following laboratory courses MIPM 402L 408 421 576 or Gen 520L minimum of 6 additional credits selected from MIPM courses at 300 level or above and Gen 520 Ent 374 and Pl Path 407
19	**Electives**
128 5	**Total credits**

*See department for procedures to meet these requirements

Typical Program for the First Year

Cr	Fall
4	General Chemistry—Chem 163 or 177
1	Laboratory in General Chemistry—Chem 163L or 177L
3	Freshman Composition—Engl 104
3	Principles of Biology—Biol 201
1	Laboratory in General Biology—Biol 201L
3	Elective
0 5	Library 160
R	Orientation in Microbiology—MIPM 110

Cr	Spring
3	General Chemistry—Chem 164 or 178
3	Freshman Composition—Engl 105
3	Principles of Biology—Biol 202
1	Laboratory in General Biology—Biol 202L
6	Computer science math electives

Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the microbiology curriculum

Curriculum in Nutritional Science

Administered by the Department of Food Science and Human Nutrition and available to students in both the College of Agriculture and the College of Family and Consumer Sciences

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 314 FCEdS 310 Lib 160,Sp Cm 212 communication-intensive requirement*
58-63	**Mathematical, physical, and life sciences** 3 cr college level math Com S 103 or equivalent Stat 101 or 104 Chem 163 163L 164 164L or 177 177L 178 211 331 332 333A 334A Phys 111 112 B B 404 and 405 or 420 Biol 201 201L 202 202L MIPM 202 202L Zool 355
18	**Personal development, human relations, and global awareness** HDFS 102 or Psych 230 3 cr in ethics *3 cr in critical thinking 3 cr in international/multicultural awareness * 6 cr in humanities and/or social science to total 9 credits in each category
24-29	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 FSHN 203 214 360 360L 480, HRI 287 or 380 and 380L + 10-12 cr from the following FS HN 403 419 461 463 490C 499 560 565, 575 problem-solving component * environmental-intensive component*
5 5-15 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements College of Agriculture critical thinking requirement met by Psych 230

Curriculum in Pest Management

Administered by the departments of Agronomy Animal Ecology Entomology, Forestry Horticulture and Plant Pathology Must be taken as a secondary major in conjunction with a primary major Students with primary majors in other than the sponsoring departments also are encouraged to enroll in the pest management program Additionally a minor in pest management is available the requirements appear under Pest Management Courses and Programs

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 and a minimum of 3 cr in speech fundamentals with grades of C or better Lib 160 electives and a communication -intensive requirement*
6	**Mathematical sciences** Stat 104 Math 140 or 150 students must demonstrate computer proficiency according to procedures established by their primary major
9	**Physical sciences** Chem 163 163L 231 232A
18-19	**Biological sciences** Biol 201 202 301 B B 301 Bot 310 or 320 A Ecl 320 320L or Biol 312 or Biol 403 or Ent 370
16	**Personal development, human relations, and global awareness** Econ 201 3 cr in humanities 3 cr in an international/multicultural awareness course(s) * 3 cr in ethics * 3 cr in critical thinking * and environmental-intensive requirement * and problem solving-intensive requirement*
8-9	**Agricultural sciences** Agron 114 or For 101 or For 310 or Hort 221 Agron 154 Agron 206
19-24	**Pest management** P M 317 340 376 491 499 P M 407 or P M 416 electives (any 2 courses from approved list**)
32 5-39 5	**Primary major requirements and free electives**
128	**Total credits**

*See department of primary major for procedures to meet core requirements

**An approved list of elective courses may be obtained from the pest management adviser in participating departments

Typical Program for the First Year

Because pest management is a secondary major the courses taken by the student during the first year will vary depending on the primary major (see typical program for the primary major) It is recommended however that the following courses be included early in the program

Cr	
2-3	Principles of Crop Production—Agron 114 or Introduction to Forestry—For 101 or Management of Small Forest Properties—For 310 or Principles of Horticulture—Hort 221
6	Principles of Biology—Biol 201 202

Curriculum in Plant Health and Protection

Administered by the Departments of Agronomy Entomology Forestry Horticulture and Plant Pathology A minor in plant health and protection is available the requirements appear under *Plant Health and Protection Courses and Programs*

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 302 or 314 Sp Cm 102 or 212 Lib 160 and communications-intensive requirement*
42-43	**Mathematical, physical, and life sciences** Math 140 or 150 or 160 Stat 104 Chem 163 163L 231 232 Phys 106 or 111 B B 301 Biol 201 202 301 312 Bot 310 MIPM 202 202L and demonstration of computer proficiency*
16	**Personal development, human relations, and global awareness** Econ 201 3 cr in humanities from approved lists 3 cr in ethics 3 cr in critical thinking 3 cr in international/ multicultural awareness environmental-intensive requirement * problem solving intensive requirement*
33	**Plant health and protection** Pl HP 110 206 391 392 498 Agron 114 or Hort 221 Agron 154 206 317 354 354L Ent 376 Hort 420 Pl P 407
23 5-24 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements

Typical Program for the First Year

Cr	Fall
3	Freshman Composition—Engl 104
3 or 4	Mathematics requirement
3	Principles of Biology—Biol 201
4	General Chemistry—Chem 163
1	Laboratory in General Chemistry—Chem 163L
0 5	Library Instruction—Lib 160
R	Orientation in Plant Health and Protection—Pl HP 110

Cr	Spring
3	Freshman Composition—Engl 105
3	Mathematics requirement
3	Principles of Biology—Biol 202
3	Humanities requirement
3	Principles of Crop Production or Horticulture—Agron 114 or Hort 221
3	Plant Health Biology—Pl HP 206

Curriculum in Professional Agriculture

An interdepartmental curriculum offered by the College of Agriculture designed for students who have completed foundation program courses and desire to complete their degrees off campus The curriculum s administrative home is the Department of Agriculture Education and Studies Coursework is usually delivered via video-tape satellite transmission or at locations away from the Ames campus see *Off-Campus Credit Courses and Programs*

Foundation Program

Cr	Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 Lib 160 speech elective (3 cr) elective (3 cr) communication-intensive requirement*
17	**Mathematical, physical, and life sciences** Chem 163 163L Math 140 Stat 104 life sciences elective (6 cr) demonstration of computer proficiency
16	**Personal development, human relations, and global awareness** Econ 201 humanities elective (3 cr) from approved lists 3 cr in ethics 3 cr in critical thinking 3 cr in international/multicultural awareness environmental intensive requirement * problem-solving requirement*
18 5	**Lower level (100-200) electives** Suggested electives include introductory courses in crops soils animal science and accounting
64	**Total foundation program credits**

Agricultural Science Program

Cr	Degree Requirements
45	**Agricultural social sciences and economics** Select 3 courses from AgEdS 311 315 Econ 330 335 380 Soc 325 415 **Animal ecology and sciences** Select 3 courses from AST 474 A Ecl 231 341 An S 218 270 331 352 **Plant and soil sciences** Select 3 courses from AST 324 Agron 317 318 338 354 Ent 376 Hort 351 471 **Agricultural systems technology** Select one course from AST at the 300 level or higher **On-campus agricultural science workshops** Equivalent of 2 credits **Agricultural science coursework (300 level or higher)** May include courses listed above not used for group requirement excludes judging travel courses and independent study
19	**Upper level (300-level or higher) electives**
64	**Total agricultural science program credits**
128	**Total credits**

*See department for procedures to meet requirements

Curriculum in Public Service and Administration in Agriculture

Administered by the Department of Sociology

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 Jl MC 205 Sp Cm 212 Lib 160 communication intensive requirement*
19	**Mathematical, physical and life sciences** Math 150 Math 151 or Chem 163 Stat 101 electives in physical sciences (3 cr) Biol 109 electives in biological sciences (3 cr) demonstration of computer proficiency*
12	**Personal development, human relations, and global awareness**** Humanities elective (3 cr) from approved lists 3 cr in ethics 3 cr in critical thinking 3 cr in international/multicultural awareness environmental-intensive requirement * problem solving-intensive requirement*
46 47	**Public service and administration core** Economics 205 206 335 or 447 405 and 451 Political science 215 310 371 475 and 484 Sociology 110 130 325 or 340 415 420 and 464
9	**Agricultural sciences**
15	**Required area of concentration**
13 5-14 5	**Free electives**
128	**Total credits**

*See department for procedures to meet requirements

**The 3-credit College of Agriculture requirement in the social sciences is included as part of the Public Service and Administration Core

Typical Program for the First Year

Cr	Fall
3	Freshman Composition—Engl 104
3	Introductory Biology—Biol 109
3	Mathematics for Business and Social Sciences I—Math 150
3	Rural Institutions and Organizations—Soc 130
3	Principles of Macroeconomics—Econ 205
R	Orientation to Public Service and Administration in Agriculture—Soc 110

Cr	Spring
3	Freshman Composition—Engl 105
3	Principles of Microeconomics—Econ 206
3	American Government Institutions and Policies—Pol S 215
3	Fundamentals of Speech Communication—Sp Cm 212
3	Humanities elective
0 5	Library Instruction—Lib 160

Curriculum in Seed Science

Administered by the departments of Agricultural and Biosystems Engineering Agronomy Horticulture and Plant Pathology Must be taken as a secondary major in conjunction with a primary major The seed science program is designed for students with career interests in one or more aspects of the seed industry Areas of study include seed production processing pathology physiology quality control and marketing as well as seed plant designs

Cr	Degree Requirements
12 5	**Interpersonal and public communication skills** Engl 104 105 Sp Cm 212 or AgEdS 311 Lib 160 electives (3 cr) and communications-intensive requirement*
39-42	**Mathematical , physical, and life sciences** Math 140 or 150 Stat 101 or 104 Chem 163 163L B B 221 or Chem 231 232 Phys 106 or 111 or Chem 164 164L Biol 109 or 201 Biol 202 or Bot 207 Bot 310 Ent 376 Gen 330 or Biol 301 Agron 317 Pl P 407 and demonstration of computer proficiency*
16	**Personal development, human relations, and global awareness** Econ 201 3 cr each in humanities ethics critical thinking and international/multicultural awareness * and environmental-intensive requirement * and problem solving-intensive requirement*
29	**Agricultural sciences and business** Agron 114 or Hort 221 Agron 154 206 354 Econ 335 Agron or Hort electives** (6 cr) AST electives** (3 cr), Econ electives** (4 cr)
10-12	**Seed science** Agron 338 421 437 491
16 5-21 5	**Primary major requirements and free electives**
128	**Total credits**

*See department of primary major for procedures to meet core requirements

**Approved list of elective courses may be obtained from seed science adviser in administering departments

Typical Program for the First Year

Because seed science is a secondary major the courses taken by the student during the first year will vary depending on the primary major (see typical program for the primary major)

Curriculum in Zoology

Administered by the Department of Zoology and Genetics

Cr	Degree Requirements
12 5	**Communications** *Engl 104 105 an advanced* English writing course (Engl 204 302-316) oral communication (AgEdS 311 Sp Cm 212 Thtre 151) Lib 160
11	**Math** Must include at least one course from both calculus and statistics chosen from Math 160 161 165 166 175 176 Stat 101 or 104 401 402 403
3	**Computer studies** 3 credits in computer science or computer applications chosen from an approved list See department for list
24	**Physical sciences** Chem 177 177L 178 178L (or 211) or 163 163L 164, 164L 231 232 or 331 332 333 334 or B B 404 or 420 Phys 111, 112 or 221 222
16	**Biological sciences** Biol 201 201L 202 202L 301 301L 302 302L
15	**Personal development, human relations, and global awareness** 15 credits including 3 credits each in the humanities social sciences ethics critical thinking and international/multicultural awareness chosen from an approved list The environmental-intensive and problem solving-intensive college requirements can be satisfied by selection of appropriate departmental courses *See department for list* of rules
22	**Zoology** Zool 110 355 18 credits in zoology numbered 300 or above 6 of which must be numbered 400 or above Three of the elective courses must include a laboratory
6	**Agricultural sciences** Choose 6 credits from any lecture or lab course numbered 300 or above taught by the following departments Animal Ecology Animal Science or Entomology
	Electives Additional electives sufficient to *equal the 128 credits required* for graduation
128	**Total credits**

*No more than 4 credits in 490Z may be applied toward this requirement No credits of 490S and 490U may be used to fill this requirement

Typical Program for the First Year

Cr	Fall
R	Opportunities in Zoology—Zool 110
3	Freshman Composition—Engl 104
4	General Chemistry—Chem 177
1	Laboratory in General Chemistry—Chem 177L
4	Calculus—Math 160 or 165 or 175
3	General Biology—Biol 201
1	Laboratory in General Biology—Biol 201L
0 5	Library Instruction—Lib 160

Cr	Spring
3	Freshman Composition—Engl 105
3	General Chemistry—Chem 178
1	Laboratory in General Chemistry—Chem 178L
4	Calculus—Math 161 or 166 or 176
3	General Biology—Biol 202
1	Laboratory in General Biology—Biol 202L

College of Business

David L Shrock Dean

Departments of the College

Accounting
Finance
Management
Marketing
Transportation and Logistics

Objectives of the Curricula in Business

The instructional objective of the College of Business is to provide a well rounded professional education in business Such an education should provide the student with (1) an appreciation of the evolution of the profession and an awareness of the social technological and economic forces shaping its future (2) an understanding of the major functional areas of business with the opportunity for specialization for a career in business (3) an ability to recognize and appreciate ethical and social values (4) an opportunity for advanced study

A comprehensive education in business includes a broad foundation in the liberal arts the major functional areas of business activity proficiency in analytical methods and the ability to identify problems and arrive at logical solutions In addition a professional education is designed to inspire students to assume business and community leadership

The curricula in business are accredited by the American Assembly of Collegiate Schools of Business (AACSB) the national business accrediting agency

Organization of Curricula

The undergraduate curricula in business are divided into two phases a general education (pre-business) program and a professional program The pre-business requirements provide a broad foundation in the liberal arts The professional program includes two parts (1) the business core which provides a common body of knowledge in all the functional areas in business and (2) a major curriculum The six major curricula offered for the degree bachelor of science (B S) are accounting finance management management information systems marketing and transportation and logistics An opportunity to take elective courses is also a part of the curricula

Bachelor of Science

The bachelor of science (B S) degree offers a comprehensive in-depth program of study in business to prepare students for professional careers in specialized functions of business and government Candidates for this degree must satisfy the requirements established by the College of Business and also the requirements for individual majors specified by the departments of the college All candidates for the B S degree are required to complete one of the following majors accounting finance management management information systems marketing or transportation and logistics

Required High School Preparation

Students entering the pre-business curriculum must present evidence of the following high school preparation
a 4 years of English which would typically include courses in composition and literature and might additionally include courses in speech and journalism
b 3 years of mathematics to include 1 year each of algebra I geometry and algebra II
c 3 years of science to include at least 1 year each of two of the sciences biology chemistry or physics
d 2 years of social studies to include 1 year of American history and at least ½ year of American government

Admission Standards to Professional Programs

All new entering students are enrolled in a pre-business curriculum Students must satisfy certain minimum requirements before being admitted to the professional program in the College of Business

The requirements are

1 Credit for the foundation courses and completion of 60 credits as prescribed in the general education (pre business) program

2 Achievement of a minimum cumulative grade-point average of 2 5 or a minimum GPA of 2 5 in the foundation courses

Transfer grades are used to determine admission into the professional program Courses at the 300 and 400 levels in the College of Business are not available to pre-business students To facilitate registration students may be conditionally admitted during the semester in which they complete the admission requirements

Admission requirements are subject to change Applications and the current requirements for admission to the College of Business are available from the Pre-business Advising Office or the Undergraduate Programs Office in the College of Business

Academic Standards and Graduation Requirements

Policies for juniors and seniors enrolled in the College of Business may be obtained from the Undergraduate Programs Office 396 Carver Hall Students are responsible for knowing and adhering to these College of Business policies as well as the university regulations found in this catalog The following policies are in effect for students graduating from a professional curriculum in business with a B S degree under the 1993 95 catalog (1) A minimum of 124 5 semester credits are required (2) Business majors may transfer only Acct 215 284 and 285 from a two-year college All 300 and 400 level business credits must be earned at a four-year college (3) A minimum of 12 credits of the last 32 credits earned in residence must be applied to the business core and/or the major (4) The major departments reserve the right to determine the appropriate section of the degree program to which transfer credits will be assigned (5) English proficiency is achieved by earning a C or better in two of the three required English courses (6) A student must earn a grade of C or higher in a minimum of 30 credits applied to the business core and the major (7) A student must earn at least 42 credits of 300 level coursework from a four year institution (8) Business majors may not take business courses Pass-Not Pass (P/NP) (9) General education courses may not be taken P/NP (10) No more than 9 elective credits may be taken P/NP

Curriculum in Business

Leading to the degree bachelor of science with a major in accounting finance management management information systems marketing or transportation and logistics or leading to the degree bachelor of science with a major in general business Total credits required 124 5

Pre-business Curriculum

Cr	
36 5	Foundation Courses
6	Engl 104 105
6	Math 150 151[1,2]
4	Com S 103
6	Econ 205 206
5	Stat 227[2]
3	Mgmt 235
6	Acct 284 285
5	Lib 160

Cr	
	General Education Requirements
9	**Humanities**
3	Phil 230
3	History course(s)
3	Select from the arts and humanities[3]
3	**Natural science**
3	Select from approved list[3]
6	**Behavioral science**
6	Select from social sciences[3]
6	**Global perspectives**
6	Select from approved list
6	**Other required courses**
3	Acct 215
R	BusAd 100
3	**Sp Cm 212**

[1]Students not adequately prepared in mathematics may have to take remedial courses in addition to courses listed above Remedial mathematics courses may not be used to satisfy credit requirements for graduation in the business curricula

[2]Substitutions can be made See pre business advising office or the Undergraduate Programs Office in the College of Business

[3]Approved list of courses is available from the pre business advising office or the Undergraduate Programs Office in the College of Business

Professional Program (Junior and Senior Years)

Cr	
21	**Business Core**
3	Engl 302
3	Fin 350
9	Mgmt 318 370 478
3	Mkt 340
3	TrLog 360
18 21	**Business Major** Select one
	Accounting
18	Acct 383 385 386 387 496 497
3	Select from Acct 388 486 487 498 499
	Finance
6	Fin 352 354
9	Select from Fin 351 357 358 452 453 454 455 457 499
6	Select from Acct 383 385 386 387 388 any 400 level Acct course Econ 301 304 355 405
	Management Option in Production/ Operations Management
12	Mgmt 371 418 422 471
6	Select from department-approved list
	Option in Employee and Labor Relations
12	Mgmt 371 471 Econ 404 445
6	Select from department-approved list
	Option in Small Business Management/ Entrepreneurship
12	Acct 383 Fin 352 Mgmt 415 Mkt 447
6	Select from department-approved list
	Option in General Business
15	Acct 383 Fin 352 Mgmt 371 Mkt 447 TrLog 460
3	Select from department-approved list
	Management Information Systems
12	Com S 201 Mgmt 335 430 432
6	Select from department-approved list
	Marketing
6	Mkt 444 447
12	Select from department-approved list
	Transportation and Logistics
12	TrLog 460 461 462 469
3	Select from TrLog 364 463 466 468
3	Select from department approved list
16-19	**Elective Courses** Select courses to broaden or complement the requirements (see adviser)

Advising System

Students in the pre business curriculum will be advised by a pre-business adviser Following admission to the professional program in the College of Business students will be assigned an academic adviser in their declared major The advising system is intended to assist students in developing their academic programs and in meeting their educational objectives

The college offers an orientation program each summer for new entering students All students and parents are encouraged to attend the orientation session Placement examinations are given in mathematics and English to aid in determining each student s level of achievement The adviser and the student prepare an appropriate schedule The student registers for classes during the orientation period

Honors

Pre-business students may apply for associate membership in the honors program students may apply for full membership after admission to the professional program in the College of Business Special advisers will assist honors students in developing an appropriate program of study

Internships

A limited number of internships in business may be available through the departments To qualify a student should be a junior or senior Arrangements must be made with the major department prior to the beginning of the internship

Double Majors

Students in the College of Business may pursue a second major Those desiring a second major outside the college should refer to the catalog section of the appropriate college and department for the second major

Undergraduates with a primary major in the College of Business may complete another major specialization in the College of Business A minimum of fifteen credit hours in the second major may not be used to satisfy any other department college or university requirement

Undergraduates with a primary major outside the College of Business must meet the admission requirements for the professional program in the College of Business complete the business core courses and the major specialization General education courses may be used to satisfy the College of Business B S degree s general education requirement

Minor

The College of Business offers a structured minor in general business to students outside the college Prerequisites for the minor are the business foundation courses (See *Curriculum in Business*) Requirements for the 15-credit minor are Fin 350 Mgmt 318 370 Mkt 340 and TrLog 360 The minor must include at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher Students wishing to earn a minor in business must meet the admissions requirements of the College of Business (see admission standards to professional programs)

Students with a primary major in the College of Business may qualify for a minor specialization in one of the college s departments by taking at least 15 credit hours in the minor specialization nine hours of which may not be used to satisfy any other department college or university requirement The minor must include at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher

The students with a major outside the College of Business are eligible for business minor only—not a specialization in a business department

Special Students

Students who wish to take courses in the College of Business but are not seeking an undergraduate degree should apply to the college as special students Special students are eligible to take up to 9 credits in 300-level and above business courses without meeting the college s admission requirements Students who desire to take more than 9 credits however must meet the college s admission requirements and have approval of a department chair Special students must meet all course prerequisites

International Business Certificate

A student in the College of Business may earn the International Business Certificate which formally recognizes the student s completion of a structured undergraduate program stressing knowledge of the global business environment through language and cultural study The requirements for the International Business Certificate are available in the College of Business Undergraduate Programs Office 396 Carver Hall The International Business Certificate is recognized and awarded by the College of Business upon graduation with the B S degree in the College of Business but will not appear on a student s transcript

Graduate Study

Two programs are offered at the graduate level a master of business administration (M B A) program and a master of science (M S) with a major in business administrative sciences These programs are intended to meet two sets of educational objectives

The M B A is the professional management education program for those pursuing careers in business or industry The purpose of this professional program is to provide a current professional business education by preparing students to understand the impact of technology on business organizations in a global environment The M B A program consists of a 48-credit curriculum leading to a nonthesis master of business Students may develop specialized study in either agribusiness or one of the functional areas in business For additional details see *Index Business Courses and Programs*

The M S program consisting of 30 minimum credits is oriented toward further business specialization at the master s level for students with undergraduate degrees or backgrounds in business The program is intended to serve those students who desire specialized study of an area within business Students in the program must complete a thesis This program is also a suitable vehicle for students planning to pursue a Ph D in business For additional details on program requirements see *Index Business Courses and Programs*

The College of Business and the Department of Architecture jointly offer the double degree program master of business administration/ master of architecture (M B A /M Arch)

Various departments in the College of Business participate in the following graduate level interdepartmental offerings Industrial Relations (interdepartmental program) Transportation Planning (interdepartmental major) Gerontology (interdepartmental minor) and Technology and Social Change (interdepartmental program)

College of Design

Rabindra N Mukerjea Interim Dean

Departments of the College

Architecture
Art and Design
Community and Regional Planning
Landscape Architecture

The College of Design as one of only a handful of comprehensive design schools in the United States offers outstanding opportunities for both disciplinary and interdisciplinary design education An interdisciplinary design core curriculum offered collaboratively by the college s departments initiates the understanding of and sensitivity to the substantive links and disciplinal relationships among all majors in the college and exposes all students to the broader visual and environmental world of which their activity is a part

The college s programs also encompass many special opportunities for individualized studies as well as extracurricular activities such as visiting lectures and symposia workshops gallery exhibits practicum and internship programs field trips and foreign study programs

Professional Opportunities

Career opportunities for graduates are many and varied Graduates of the College of Design are either self-employed designers or artists or they are employed in private firms government industry and education Specific programs of study prepare students for a variety of careers as architects landscape architects environmental designers interior designers graphic designers community and regional planners arts administrators and studio artists Students are often introduced to the areas of professional practice through field trips practicum and internship program opportunities

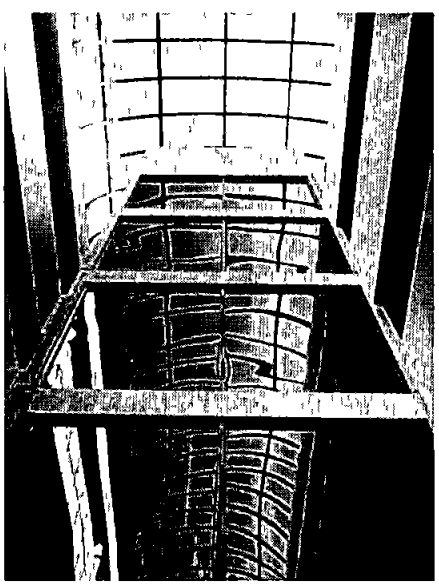
High School Preparation

Students planning to enroll in an academic program of the College of Design must complete the following high school course requirements 4 years of English to develop communication skills critical reading and writing ability including coursework in composition and literature and additional coursework which may include 1 year of speech and/or journalism 3 years of mathematics to develop problem solving skills including 1 year each of algebra geometry and advanced algebra 3 years of science to provide an ecological awareness including at least two of the following 1 year of biology 1 year of chemistry or 1 year of physics 2 years of social studies to develop an understanding of human behavior including at least 1 year of U S history and 1 semester of U S government

In addition courses in the fine arts and design that help in the development of visual skills although not required for entrance are **highly recommended** for students desiring to pursue a curriculum in the College of Design

Special Requirements

Students admitted into the departments of Architecture and Landscape Architecture are at first enrolled in the preprofessional programs in these departments Admission into the professional programs depends on available resources and is subject to review by faculty committee Some of the requirements and qualifications considered are portfolio review scholastic performance aptitude and personal development In some instances this review occurs when students have completed a basic program or a stated group of courses and successful fulfillment of these requirements is necessary before the student can enroll in advanced or professional courses in the particular program Students enrolled in all curricula in the Department of Art and Design must complete a set of basic course requirements before entering a specific program of study In addition admission into the graphic design and interior design curricula depends on available resources and is subject to academic performance and portfolio review



Approach to Education

The College of Design strives to provide each student with a broad educational background as well as with preparation in a specific area of environmental design and the arts Each program offered by the college is designed to develop knowledge and appreciation of the physical and cultural environment to stimulate creative thinking and analysis and to prepare students for participation in a particular design profession Field trips are an integral part of studies in several of the design curricula Guest speakers seminars and exhibits are regular features and studio classes frequently are enhanced by visiting professionals

All curricula in the College of Design are structured along three areas general education general design education and disciplinal education General education requirements are completed in the following areas biological and physical sciences and mathematics communications humanities and social sciences General design education includes a six-credit design core consisting of two courses normally completed within the first two years of study a history course in the College of Design outside the student s curriculum area and a course in the interdisciplinary design studies program, and either an interdisciplinary design studio or a studio in another discipline which is taken in the third or fourth year Disciplinal education delves into the professional areas and is intensive in building a student s skills and knowledge in the specific major area Within the major area the student will develop creative and professional skills through classroom and studio work critiques of student projects discussions with professional practitioners and field studies

Academic Advising

Each student in the College of Design receives personal assistance in program planning from an academic adviser within the student s curriculum area Advisers assist students in developing academic programs of study and provide information on career choices Students who are uncertain of their primary direction within the college are encouraged to explore courses related to several curricula

Honors Program

The College of Design participates in the Honors Program which encourages outstanding students to develop programs to fit their talents abilities or professional goals For further information contact the chair of the College Honors Committee

Curricula

The undergraduate curricula are
Architecture, B Arch
Art and Design B A B F A
Community and Regional Planning B S
Graphic Design B F A
Interior Design, B F A
Landscape Architecture B L A

The graduate curricula are
Architecture M Arch
Architectural Studies M S
Art and Design M A
Art Education M A specialization
Community and Regional Planning M C R P
Graphic Design M F A
Interior Design M F A
Landscape Architecture M L A

Interdepartmental graduate double degree programs are available as follows

M Arch /M C R P
M C R P/M L A
M Arch /M B A (business administration)
M C R P /M P A (public administration)

In addition the College of Design participates in the university s international studies and environmental studies programs These programs are offered as secondary majors or minors to interested students

The College of Design offers an undergraduate minor in design studies (see *Index Design Studies*) The college also participates in the transportation planning major and the following graduate and undergraduate minors technology and social change housing and gerontology

Requirements in the College of Design

All students in the College of Design are expected to meet the following requirements of the college

General Education

Cr	
6 min	**Biological, physical sciences and mathematics** Includes courses in the fields of agronomy astronomy and astrophysics biology botany chemistry civil engineering computer science geology geography mathematics, physics statistics and zoology
9 5 min	**Communications** Engl 104* 105* Lib 160 Includes courses in the fields of English (composition) speech communication (interpersonal and rhetorical) and family environment (F E 370)
6 min	**Humanities** Includes courses in the fields of dance English (literature) foreign languages history music (theory and literature) philosophy religious studies theatre
6 min	**Social sciences** Includes courses in the fields of anthropology economics family environment political science psychology and sociology
9 min	**Selected from the above areas** Six credits must be at the 300 level or above
36 5	**Total credits**

See departmental curricula for specific course requirements within the general education areas

General Design Education

Cr	
3	**History requirement** A history course in the College of Design but outside the student s curriculum area to be selected from approved list (Dsn S 121 may be used if taken prior to completing 60 credits)
3	**Design studies course** A course in design studies to be selected from approved list (Dsn S 121 unless used for history requirement or Dsn S 129 may be used if taken prior to completing 60 credits)
3-6	**Options in studio, history, theory, crticism, and methods** Studio history theory criticism and/or methods courses in the College of Design outside the student s curriculum area are to be selected from approved list (Dsn S 121 unless used for history requirement or Dsn S 129 unless used for design studies requirement may be used if taken prior to completing 60 credits)
9-12	**Total credits (at least 3 credits must be at the 300 level or above)**

*To meet requirements for graduation a minimum grade of C- must be received

Design Studies

In addition to the courses taught by the four departments the College of Design offers interdisciplinary courses See *Design Studies Courses and Programs* The college offers a minor in design studies which consists of a minimum of 15 credits earned in the College of Design

Basic requirements for design studies minor

Cr	
6	**Design studies courses** Select from any course offered by the design studies program
9	**Studio, history, theory** Select from courses offered by one or more departments within the college
15 min	**Total credits**

Note Six credits in the above two areas must be at the 300 level or above The college s Office of Student Programs and Services has a list of courses from which choices may be made Students in the College of Design may not use design studies courses specifically required in their curricula as part of the minor and may not use courses offered by their specific departments toward the minor

Curriculum in Architecture

The department offers undergraduate and graduate degree programs

A 141-credit undergraduate professional program preceded by a 28 5-credit preprofessional program leading to the bachelor of architecture degree

A three-part 100-credit program leading to the master of architecture Applicants holding B S or degrees in architecture or environmental design are given advanced standing in this program For applicants holding professional degrees in architecture (B Arch or M Arch) a 30-credit post-professional course of study is available

A 34-credit graduate program leading to the degree master of science in architectural studies a research oriented degree

For more complete graduate program descriptions see *Graduate Study* under *Architecture* in the *Courses and Programs* section

Students are advised to seek faculty counsel regarding a career in architecture Most states require that an individual intending to become an architect hold an accredited degree There are two types of degrees that are accredited by the National Architectural Accrediting Board (1) The bachelor of architecture which requires a minimum of five years of study and (2) the master of architecture which requires a minimum of three years of study following an unrelated bachelor s degree or two years following a related preprofessional bachelor s degree These professional degrees are structured to educate those who aspire to registration or licensure as architects

The four-year preprofessional degree where offered is not accredited by the NAAB The preprofessional degree is useful as preparation for further study in a professional architecture degree program or for employment options in a related field

Preprofessional Program

First Year

Cr	Fall/Spring
4	Arch 102*
6	Engl 104/105
3	Math 142
4	Physics 111
6	Social science/humanities options**
5	Electives**
0 5	Lib 160
28 5	

Professional Program

Second Year

Cr	Fall
6	Arch 201
2	Arch 230
3	Arch 221
3	Social science and humanities option*
4	Arch 240
18	

Cr	Spring
6	Arch 202
2	Arch 232
3	Arch 222
4	E M 241
3	Arch 271
18	

Third Year

Cr	Fall
6	Arch 301
3	Arch 352
3	C E 336
3	Arch HTC option*
3	Social science and humanities option*
18	

Cr	Spring
6	Arch 302
3	Arch 372
3	C E 438
2	Design communication option*
3	Elective*
17	

Fourth Year

Cr	Fall
6	Arch 401
3	Arch 452
3	Arch 440
13	C E 439
3	Communication option*
18	

Cr	Spring
16	Arch 402**
3	Professional option**†
2	Design communication option**
3	Arch HTC option*
3	Elective*
17	

Fifth Year

Cr	Fall
6	Arch 403
2	Arch 483
3	Arch 482
3	College elective*
3	Elective*
17	

Cr	Spring
6	Arch 404
3	College elective*
6	Professional options**†
3	Elective*
18	

*Choose from a faculty approved list of courses

**May be substituted by Dsn S 446 (Interdisciplinary Design Studio)

†May be included in college requirements

Curriculum in Art and Design—B.F.A.

Leading to the degree bachelor of fine arts
Total credits required 120 5

This curriculum offers three concentrations for the student (1) a concentration in craft design (ceramics jewelry and metalsmithing fiber and wood) (2) a concentration in drawing/painting/printmaking and (3) a concentration in visual studies (calligraphy computer-aided art and design illustration photography two- and three-dimensional mixed media)

Admission into the art and design B F A curriculum is subject to completion of a minimum of 27 5 credits including Art 108 109 110 130 230 Engl 104 and 105 Lib 160 and 9 credits in general education coursework

Transfer students with studio credits from other colleges and universities must present for department review a portfolio of work done in those courses in order to have the credits apply toward studio requirements Students are advised to present this portfolio of work upon admission and prior to registration for classes

Cr	Degree Requirements
36 5	**General education**
6 min	**Biological and physical sciences and mathematics** Select from Astro 120 150 Biol 109 201 202 Bot 102 202 207, Chem 160 163 163L Com S 103 107 Geol 100 Math 104 or 150 105 140 141 151 152L Phys 101 106 Stat 101 104 Zool 155 258 or any higher level course in these disciplines for which these courses are prerequisite
19 5 min	**Communications**
6	Engl 104 and 105
3	Select from CmDis/Ling 286 CmStd 101 102 Engl 204 Sp Cm 212
0 5	Lib 160
	Communications courses available for completing 9 credit requirement below are CmDis/Ling 286 ComSt 102 214 310 311 317 325 Engl 204 205 219 303 304 305 306 309 314 315 316 Sp Cm 212 305 312
6 min	**Humanities** Select from Dance 270 360 Engl 201 230 231 335 340 341 346 347 348 353, 354 360 361 362 363 364 373 374 375 376 377 378 379 F Lng 101 102 110 201 202 301 302 Hist —all courses Music 102 103 383 384 Phil — all courses Relig 240 250 334 353 365 Thtre 106
6 min	**Social sciences** Select from Anthr 201 202 306 Econ 201 205 206 Pol S 215 241 251 Psych 101 230 250 Soc 130 or 134 or any higher level course in these disciplines for which these courses are prerequisite or select from HD FS 349 367 373 377
9 min	**Selected from the above areas and courses** Six credits must be at the 300 level or above
9 min	**General design education**
3	Select a history course from Arch Art H Dsn S or L A The course must be from outside the student s curriculum and from an approved list
3	Select from Dsn S 121 129 201 426 446 480 or other approved design studies courses
3	Select studio history theory or criticism course in the College of Design outside the student s curriculum area see approved list
24	**Art and design core**
6	Visual Foundations I and II—Art 108 109
R	Orientation to Art and Design—Art 110
6	Drawing I and II—Art 130 230
6	History of Art I and II—Art H 280 281
6	Art history selections (300 level or above)

Craft Design Concentration

15	**Concentration requirements**
3	Wood Design I—ArtCD 220
3	Ceramics I—ArtCD 222
3	Jewelry and Decorative Metalsmithing I—ArtCD 227
3	Select from Fiber Forms—ArtCD 343 Weaving—ArtCD 344 Fiber and Fabric Design—ArtCD 345 Resist and Dyed Fabric Design—Art CD 346 Printed Fabric Design—ArtCD 347
3	Select other ArtCD course
18	**Studio options** Select from ArtCD courses or ArtDP or ArtVS courses
18	**Electives**
120 5	**Total credits**

Drawing/Painting/Printmaking Concentration

15	**Studio requirements** Select 5 different courses from among the following Painting I—ArtDP 238 Drawing III Life Drawing—ArtDP 330 Painting II—ArtDP 338 Lithography—ArtDP 358 Intaglio—ArtDP 359 Drawing IV—ArtDP 430
18	**Studio options** Select from ArtDP courses or ArtCD or ArtVS courses
18	**Electives**
120 5	**Total credits**

Visual Studies Concentration

14-15	Studio requirements
3	Select from Sources of Visual Design—ArtVS 300, Two-Dimensional Mixed Media—ArtVS 305 Three Dimensional Mixed Media—ArtVS 306
11-12	Select from three-dimensional studio courses or a combination of three-dimensional and two-dimensional studio courses*
18	Studio options* Select from ArtVS ArtCD and ArtDP courses It is strongly suggested that the student focus studio courses in two or three areas
18-19	Electives
120 5	Total credits

*Specific course information in relation to this requirement available in department office

Curriculum in Art and Design—B.A.

Leading to the degree bachelor of arts Total credits required 120 5

This curriculum offers a general concentration in studio and/or art history in combination with a second major minor and/or approved program outside the department

Admission into the art and design B A curriculum is subject to completion of a minimum of 27 5 credits including Art 108 109 110 130 230 Engl 104 and 105 Lib 160 and 9 credits in general education coursework

Transfer students with studio credits from other colleges and universities must present for department review a portfolio of work done in these courses in order to have the credits apply toward studio requirements Students are advised to present this portfolio of work upon admission and prior to registration for classes

Cr	Degree Requirements
36 5	**General education**
6 min	**Biological and physical sciences and mathematics** Select from Astro 120 150, Biol 109 201 202 Bot 102 202 207 Chem 160 163 163L Com S 103 107 Geol 100 Math 104 or 150 105 140 141 151 152L Phys 101 106 Stat 101 104 Zool 155 258 or any higher level course in these disciplines for which these courses are prerequisite
9 5 min	**Communications**
6	Engl 104 and 105
3	Select from CmDis/Ling 286 CmStd 101 102 Engl 204 Sp Cm 212
0 5	Lib 160
2	Communications courses available for completing 9 credit requirement below are CmDis/Ling 286 ComSt 102 214 310 311 317, 325 Engl 204 205 219 303 304 305 306 309 314 315 316 Sp Cm 212 305 312
6 min	**Humanities** Select from Dance 270 360 Engl 201 230 231 335 340 341 346 347 348 353 354 360 361 362 363 364 373 374 375 376 377 378 379 F Lng 101 102 110 201 202 301 302 Hist—all courses Music 102 103 383 384 Phil— all courses, Relig 240 250 334 353 365 Thtre 106
6 min	**Social sciences** Select from Anthr 201 202 306 Econ 201 205 206 Pol S 215 241 251 Psych 101 230 250 Soc 130 or 134 or any higher level course in these disciplines for which these courses are prerequisite or select from HD FS 349 367 373 377
9 min	**Selected from the above areas and courses** Six credits must be at the 300 level or above
6 min	**General design education****
3	Select a history course from Arch Art H Dsn S or L A The course must be from outside the student s curriculum and from an approved list
3	Select from Dsn S 121 129 201 426 446 480 or other approved design studies course
24	**Art and design core**
6	Visual Foundations I and II—Art 108 109
R	Orientation to Art and Design—Art 110
6	Drawing I and II—Art 130 230
6	History of Art I and II—Art H 280 281
6	Art history selections (300 level or above)
15	**Art and design options**** Select from art history craft design drawing/painting/printmaking visual studies Six credits must be at the 300 level or above two- and three-dimensional experiences recommended
27	**Second major or minor, * and/or approved program****
12	**Electives**
120 5	**Total credits**

*A second major or minor must be approved by the department offering the program of study See university guidelines for structuring and declaring a second major and/or minor Credit hours not applied toward a formal second major or minor must be used in a coherent program approved by the Department of Art and Design Approval for these 27 credits must be documented in writing following completion of 75 credits and before completion of 100 credits toward the B A degree

**The general design education studio history theory and criticism courses requirement of 3 to 6 credits will be fulfilled within the art and design options or within the approved program

Curriculum in Community and Regional Planning

Leading to the degree bachelor of science Total credits required 128 5

Areas of concentration include housing urban design planning management and implementation planning in developing countries social planning transportation planning environmental planning community and rural development and land use planning

Cr	Degree Requirements
11 5	**Communications** Engl 104 105 or 105S 309 or 314 Lib 160 Sp Cm 212
9	**Humanities**
10	**Mathematics** Com S 103 Stat 101
6	**Natural sciences**
21	**Social sciences** Econ 201 or 206 Pol S 215 Soc 134, options
9	**Design core** General design education ** or from approved options
6	**Engineering and transportation options** Engr 135 C E 350
35	**Community and regional planning core** C R P 253 272 274 383 432 491 492 options
14	**Planning related specialty**
7	**Electives**
128	**Total credits**

**See College of Design requirements

Curriculum in Graphic Design

Administered by the Department of Art and Design Leading to the bachelor of fine arts degree Total credits required for graduation 121 5 This curriculum is planned for students preparing to enter the professional field of graphic design

Consideration of admission into the graphic design curriculum requires completion of at least one year of study at ISU Admission is based on department resources and will be determined by overall cumulative gradepoint average following completion of 23 credits including the following courses Art 108 109 110 130 ArtGr 177 DsnS 121 Engl 104 or 105 and 6 credits of general education A portfolio review also will be a primary factor in the admission review process

Transfer students with studio credits from other colleges and universities must present for department review a portfolio of work done in these courses in order to have the credits apply toward studio requirements Students are advised to present this portfolio of work upon admission and prior to registration for classes

Cr	Degree Requirements
39 5	**General education**
6 min	**Biological and physical sciences and mathematics** Select from Astro 120, 150 Biol 109 201 202 Bot 102 202 207 Chem 160, 163 163L Com S 103 107 Geol 100 Math 104 or 150, 105 140 141 151 152L Stat 101 104 Phys 101 106 Zool 155 258 or any higher level course in these disciplines for which these courses are prerequisite
9 5 min	**Communications**
6	Engl 104 and 105
3	Select from CmDis/Ling 268 CmStd 101 102 Engl 204 Sp Cm 212
0 5	Lib 160 Communications courses available for completing 9 credit requirement below are CmDis/Ling 286 CmStd 101 102 214 310 311 317 325 Engl 204 205 219 303 304 305 306 309 314 315 316, Sp Cm 212 305 312
6 min	**Humanities** Select from Dance 270 360 Engl 201 230 231 335 340 341 346 347 348 353 354 360 361 362 363 364 373 374 375 376 377 378 379 F Lng 101 102 110 201 202 301 302 Hist—all courses Music 102 103 383 384 Phil—all courses Relig 240 250 334 353 365 Thtre 106
6 min	**Social sciences** Select from Anthr 201 202 306 Econ 201 205 206 Pol S 215, 241 251 Psych 101 230 250 Soc 130 or 134 or any *higher level course in these* disciplines for which these courses are prerequisite or select from HD FS 349 367 373 377
12 min	**Selected from the above areas and courses** Six to nine credits must be at the 300 level or above
6 min	**General design education****
3	History of Design—DsnS 121*
3	Select a history course from Arch Art H Dsn S or L A The course must be from outside the student s curriculum and from an approved list
24	**Art and design core**
6	Visual Foundations I and II—Art 108 109
R	Orientation to Art and Design—Art 110
6	Drawing I and II—Art 130 230
6	History of Art I and II—Art H 280 281
6	Studio options** Select from ArtCD ArtDP ArtVS or other approved studio course
46	**Graphic design concentration**
2	Introduction to Graphic Design—ArtGr 177
3	Design Through Photography—ArtVS 229 or Fundamentals of Photography—JI MC 309 concurrent with Laboratory in Fundamentals of Photographic Technique—JI MC 310
8	Graphic Design Studio I and II—ArtGr 270 271
1	Graphic Design Internship Seminar—ArtGr 277
10	Graphic Design Studio III and IV—ArtGr 370 371
6	Graphic Design History/Theory/Criticism I and II ArtGr 387 388
10	Graphic Design Studio V and VI—ArtGr 470 471
3	Graphic Design Internship—ArtGr 480
3	Graphic Design Professional Practices—ArtGr 481
6	**Electives**
121 5	**Total credits**

*Transfer students with more than 60 credits must substitute another design studies course to meet this requirement

**The general design education studio history theory and criticism courses requirement of 3 to 6 credits will be fulfilled within the 6 credit studio options requirement

Curriculum in Interior Design

Administered by the Department of Art and Design Leading to the bachelor of fine arts degree Total credits required for graduation 124 5 This curriculum is planned for students preparing to enter the professional field of interior design

Consideration of admission into the interior design curriculum requires completion of at least one year of study at ISU Admission is based on department resources and will be determined by overall cumulative gradepoint average following completion of 27 credits including the following courses Art 108 109 110 130 ArtID 167 DsnS 121 Engl 104 or 105 and a two-semester general education sequence of at least 6 credits A portfolio review also will be a primary factor in the admission review process

Transfer students with studio credits from other colleges and universities must present for department review a portfolio of work done in these courses in order to have the credits apply toward studio requirements Students are advised to present this portfolio of work upon admission and prior to registration for classes

Cr	Degree Requirements
36 5	**General education**
6	**Biological and physical sciences and mathematics**
3	Math 104 or 105 or 140 or 150
3	Select from Astro 120 150 Biol 109 201, 202 Bot 102, 202 207 Chem 160 163, 163L Com S 103 107 Geol 100 Math 104 or 150 105 140 141 151 152L Phys 101 106 Stat 101, 104 Zool 155 258 or any higher level course in these disciplines for which these courses are prerequisite
9 5	**Communications**
6	Engl 104 and 105
0 5	Lib 160
3	Select from CmDis/Ling 286 CmStd 101 102 Engl 204 Sp Cm 212 Communications courses available for completing 9 credit requirement below are CmDis/Ling 286 CmStd 101 102, 214 310 311 317 325 Engl 204 205 219 303 304 305 306 309 314 315 316 Sp Cm 212 305 312 317 325
6	**Humanities*** Select from Dance 270 360 Engl 201 230 231 335 340 341 346 347 348 353 354 360 361 362 363 364 373 374 375 376 377 378 379, F Lng 101 102, 110 201 202 301 302, Hist—all courses Music 102 103 383 384 Phil—all courses Relig 240 250 334 353 365 Thtre 106
6	**Social sciences*** Select from Anthr 201 202 306 Econ 201 205 206 Pol S 215 241 251 Psych 101, 230 250 Soc 130 or 134 or any higher level course in these disciplines for which these courses are prerequisite or select from HD FS 349 367 373 377 Mgmt 370 Mkt 340
9 min	**Select from the above areas and courses** Six credits must be at the 300 level or above
6	**General design education**
3	History of Design—DsnS 121**
3	Select a history course from Arch Art H DsnS or L A The course must be from outside the student s curriculum and from an approved list
15	**Art and design core**
6	Visual Foundations I and II—Art 108 109
R	*Orientation to Art and Design*—Art 110
3	Drawing I—Art 130
3	Graphic Communications—Engr 125
3	Studio selection*** Select from ArtCD ArtDP ArtVS
64	**Interior design concentration**
6	Interior Design Foundations—ArtID 167
3	Textile Fundamentals—T C 104
12	Interior Design Studio I and II ArtID 265 267
12	Interior Systems I II and III—Art ID 350 351 352
6	Interior Design History/Theory/Criticism I II and III—ArtID 355 356 357
8	Interior Design Studio III and IV—ArtID 365 367
1	Interior Design Internship Seminar—ArtID 369

3	Interior Design Internship—ArtID 460
2	Interior Design Professional Practices—ArtID 461
8	Interior Design Studio V and VI—Art ID 465 467
3	Select Arch ArtCD ArtDP ArtID, ArtVS CRP DsnS LA course or Mgmt 370 or Mkt 340
3	Electives
124 5	Total credits

*Sequence of two humanities courses or social sciences courses required as part of general education prior to review for entry into interior design curriculum

**Transfer students with more than 60 credits must substitute another design studies course to meet this requirement

***Course fulfills both art and design department requirement and general design education requirement of 3 to 6 credits

Curriculum in Landscape Architecture

The department offers a 5-year curriculum requiring 149 5 credits leading to the degree bachelor of landscape architecture These credits are distributed between a 2-year preprofessional program of 57 5 credits and a 3-year professional program of 92 credits

Admission into the professional program depends upon available resources and is subject to the approval of a faculty committee at the completion of the preprofessional program Scholastic performance aptitude and personal development are the qualifications considered

Preprofessional Program

First Year

Cr	Fall
3	Visual Foundations I—Art 108
3	Freshman Composition—Engl 104
3	Algebra—Math 140
3	Technical Drawing—Engr 135
3	Earth in Crisis—Geol 101
15	

Cr	Spring
3	Visual Foundations II—Art 109
3	Drawing I—Art 130
2	Trigonometry—Math 141
3	Soils for Urban Use—Agron 156
3	Forces that Shape the Urban Environment—C R P 270
0 5	Library Instruction—Lib 160
14 5	

Second Year

Cr	Fall
3	Basic Landscape Design—L A 241
2	Introduction to Landscape Architecture—L A 284
2	Engineering and Construction Surveying—C E 215
3	Introductory Biology—Biol 109
3	Design Studies or social science elective
13	

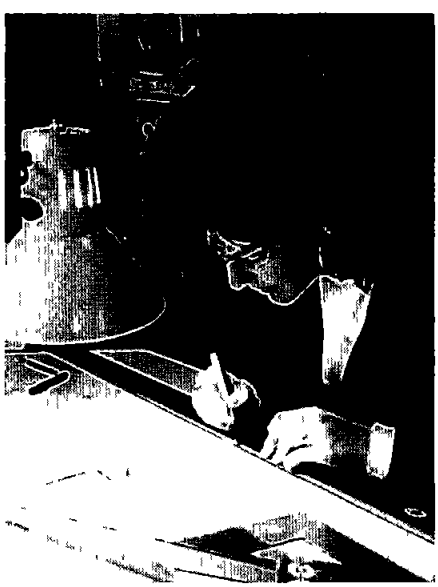
Cr	Spring
3	Fundamentals of Site Grading and Construction—L A 251
3	Landscape Architectural History—L A 271
3	General Botany—Bot 207
3	Design history or humanities electives
3	Freshman Composition—Engl 105
15	

Professional Program

Third Year

Cr	Fall
2	Presentation Techniques—L A 311
3	Fundamentals of Planting Design I—L A 321
4	Intermediate Landscape Architectural Design I—L A 342
3	Social science or design studies elective
3	Humanities or design history elective
16	

Cr	Spring
3	Landscape Inventory and Analysis—L A 361
3	Fundamentals of Planting Design II—L A 322
4	Intermediate Landscape Architectural Design II—L A 343
3	Fundamentals of Public Speaking—Sp Cm 212
3	Free or L A professional elective
16	



Fourth Year

Cr	Fall
4	Planting Design—L A 423
4	Site Construction and Structures—L A 452
2	Resource Conservation and Management—L A 461
3	Writing of Professional Papers and Reports—Engl 314 (preferred) or Business Communication—Engl 302
13	

Cr	Spring
4	Comprehensive Landscape Planning—L A 463
4	Professional Practice and Procedures—L A 453
3	Humanities or social science elective
5	Free or L A professional electives
16	

Fifth Year

Cr	Fall
4	Advanced Landscape Architectural Design—L A 443 or design education option
3	Landscape Establishment and Maintenance—Hort 342
8	Free or L A professional electives
15	

Cr	Spring
3-6	Design education option or Advanced Landscape Architectural Design—L A 443
3	Humanities or social science elective
7-10	Free or L A professional electives
16	
149 5	Total credits

Electives must include courses which satisfy the general education requirements of the college at least two elective courses must be from an L A professional elective list approved by the department

Graduate students pursuing the M L A may concurrently enroll in the undergraduate program to earn the B L A by completing at least 32 credits from the following list and maintaining a 3 00 cumulative grade-point average through graduation for the undergraduate coursework taken L A 241 251 271 311 321 322 335 342 343 361 423 443 452 453 461 463 The actual courses required will vary according to each student s landscape architectural skill level upon admission as determined by a faculty committee

College of Education

Norene F Daly Dean
Leslie Sternberg Associate Dean
David Williams Assistant Dean
Katy Rice Administrative Assistant

Departments of the College

Curriculum and Instruction
Health and Human Performance
Industrial Education and Technology
Professional Studies in Education

The College of Education provides degree programs leading to licensure in elementary education and physical education as well as a professional sequence of courses for all students at Iowa State seeking a teaching license In addition the college offers several professional programs in nonteaching fields Certain professional programs are also available at the graduate level

A person who is to work effectively with people needs broad personal and professional knowledge and understanding The College of Education strives to provide each student with a sound general education as well as preparation in an area of specialization

In addition a prospective teacher must have an understanding of teaching and of learning and skill in applying such understanding in the classroom An awareness of the characteristics of growth and development of students and the role of learning in society is also needed

Recommended High School Preparation

Recommended preparation for students entering most departments of the College of Education should include 4 years of English and speech with emphasis in composition and communication skills 3 years each of mathematics and natural sciences and 3 years of social science and/or humanities

Advising System

Each student in the College of Education works closely with an academic adviser who is associated with the curriculum in which the student is majoring Advisers assist students in developing academic programs and in adjusting to university life They also provide information and guidance about career choices Advisers attempt to adjust each student's schedule of course work in *accordance with his or her interests and* capabilities

The college offers an orientation program during *the summer for students planning to* enter in the fall Incoming students are encouraged to attend the orientation session *so tests may be taken and appropriate* classes may be scheduled for the following term

Curricula and Special Programs in the College of Education

Curriculum and Instruction

Early Childhood Education The curriculum *in early childhood education prepares* teachers for children from birth through age 8 (or approximately third grade) It is jointly administered by the Department of *Curriculum and Instruction in the College of* Education and the Department of Human Development and Family Studies in the College of Family and Consumer Sciences

Elementary Education The curriculum in elementary education prepares teachers for elementary classrooms Teaching endorsements are available in areas closely related to elementary education such as reading A special education endorsement in mental disabilities is available for undergraduate students in elementary and secondary education

Secondary Education Provides licensure programs in conjunction with subject matter areas of agriculture art (master s program) biology chemistry earth sciences English foreign languages general sciences health home economics mathematics music physical science, physics social studies and speech

Curriculum and Instructional Technology Graduate programs based on a major in education with specializations in elementary *education special education and curriculum* and instructional technology Coursework is available that leads to licensure in the areas of behavioral disorders, learning disabilities *and multicategorical education*

Health and Human Performance

Curricula in *physical education* and *community health education* The *physical education* curriculum includes options in physical education secondary licensure (7-12) physical education elementary and secondary licensure (K-6 7-12) dance exercise science athletic training sport management and general physical education studies A coaching endorsement program and a health education licensure program are also available

Industrial Education and Technology

Curriculum in *industrial education and technology* The *curriculum in industrial technology* includes options in manufacturing occupational safety and training and development

Professional Studies in Education

All graduate programs are based upon a *major in education* with specializations in adult and extension education educational administration, counselor education higher education historical philosophical and comparative education research and evaluation and vocational education

Honors Program

The College of Education Honors Program provides an opportunity for students with a 3 35 grade point average or higher to complete their course of study in the *University Honors Program For more details* contact the academic adviser the College Honors Committee or see *Index Honors Program*

Environmental Studies (secondary major only)

The College of Education participates in the Environmental Studies Program and offers a major in environmental studies that may be taken only as a second major Students pursuing a second major in environmental studies must complete the Environmental Studies Program as described in this catalog *(see Index Environmental Studies)*

International Studies (secondary major only)

The International Studies Program is an *interdisciplinary program which may be taken* only as a second major Students pursuing a second major in international studies must complete the International Studies Program as described in this catalog *(see Index International Studies)*

Minors

The following minors are available through the College of Education

Curriculum and Instruction mental disabilities educational computing Health and Human Performance athletic coaching athletic training dance and health studies

The General Education Requirement

Students in the College of Education and all prospective teachers are required to complete a program in general education which is integrated with their professional

training and extends through the undergraduate curriculum

The general education program emphasizes intellectual growth and personal development as contrasted with specific vocational preparation It is recognized that many contributions to general education may be made by courses which have other primary objectives

The program aims to stimulate a desire for learning and intellectual endeavor develop understanding and appreciation for the physical and cultural world encourage independent thinking and analysis increase competence in all aspects of communication and create an understanding of individuals as social psychological and physical beings

The student is expected to complete studies in five groups in general education Areas represented below are not departmental titles In some cases courses relating to a given area may be found in several different departments Credits listed are minimum requirements

Cr	
9	I Biological sciences physical sciences and mathematics
9	II Social sciences
6	III Humanities
9	IV Communication skills
1	V Health dance physical education safety
34	
8	Additional credits in above areas
42	

A student must have 42 semester hours in general education outside his or her academic major or minor with the minimum in each area as shown above This total will include Engl 104 and 105 one course appropriate for developing interpersonal or group presentation skills * Psych 230 Lib 160 one course in mathematics and one course in American history or government Additional credits in general education may be required by departments preparing teachers

*See college or department lists for appropriate courses

Teacher Education and Licensure

All students who are recommended by Iowa State University for teacher licensure must meet the requirements of the teacher education program and be recommended by the College of Education

Each student will be enrolled in the department in which he or she plans to major and must meet the graduation requirements of that department and the college in which it is located

For details concerning the professional teacher education requirements and the areas of specialization requirements see *Teacher Education Courses and Programs*

Curriculum in Early Childhood Education

The curriculum in early childhood education is planned for students preparing to teach pre-kindergarten through third grade The curriculum is administered jointly by the Department of Curriculum and Instruction College of Education and the Department of Human Development and Family Studies College of Family and Consumer Sciences A double major with teaching prekindergarten-kindergarten children with the early childhood special education option is available See Department of Human Development and Family Studies for information

Total credits required 136 5

Cr	
41 5	**General education**
12 5	Communication skills Engl 104 (3) 105 (3) Lib 160 (5) Sp Cm 212 (3) Options (3)
9	Natural sciences and mathematics Biological sciences (3), mathematics (3) natural science (3)
9	Social sciences American history or American government (3) options (6)
9	Humanities Options (9)
2	Health dance physical education safety H S 105 (2)
18	**Human development and family studies** FS HN 167 (3) HD FS 102 (3) or Psych 230 (3) HD FS 224 (3) 225 (3) 226 (3) select 3 credits from HD FS 255 or Sp Ed 250
71	**Professional education**
9	Professional education core El Ed 204 (3) 301 (1) 406 (2), Psych 333 (3) Orientation (R)
17	Prekindergarten-Kindergarten Education HD FS 310 (2) 340 (3) 343 (3) 445 (3) 449 (3) select 3 credits HD FS 443 or El Ed 447
21	Elementary Education El Ed 245 (2) 268 (1) 375 (3) 468A (1) 376 (3), 468B (1) 448 (3) 468C (5) 449 (3) 468D (5) 443 (3)
8	Related courses HDFS 240 (3) SecEd 101 (3) select 2 credits Art 211 (2) HD FS 353 (3) H S 275 (3) Music 265 (3), 364 (3), P E 284 (3), Thtre 359 (3) 362 (3) U St 225 (3) El Ed 450 (3)
16	Student teaching El Ed 417A (8) HD FS 417B (8)
6	**Electives**

Curriculum in Elementary Education

The curriculum in elementary education is planned for students preparing to teach in grades kindergarten through six For additional information see *Index Elementary Education Courses and Programs* A minor leading to a teaching endorsement in mental disabilities is available for elementary or secondary education majors

Total credits required 134 5

Cr	
65 5	**General Education***
11 5	Communication skills Engl 104 (3) 105 (3) Sp Cm 212 (3) Library 160 (0 5) options (3)
9	Social sciences Psych 230 (3) Pol S 215 (3) options (3)
6	Humanities options (6)
3	Health dance physical education safety options (3)
12	Math biological sciences physical sciences Math (3-4) select from Math 195 (4) or one of 140 (3) 142 (3), 165 (4) Biological sciences (3) select from Biol 109 (3) or 110 (3) Bot 102 (2) 202 (2) 207 (4) Zool 155 (3) 156 (2) 258 (3) Physical sciences (3) select from Anthr 202 (3) Astro 120 (3) 150 (3) Chem 160 (3) 163 (4) 164 (4) Geol 100 (3) 100L (1) 101 (3) 103 (3) 106 (3) LAS 111 (4) Mteor 206 (2 to 3) Phys 101 (3) 106 (4) Options to total 12 credits
24	Academic area specialization (liberal arts)
66	**Professional education**
21	Required courses 204 (3) 250 (3) 245 (2) 268 (1), 301 (1) 406 (2) HD FS 226 (3) 240 (3) or Engl 394 (3) Psych 333 (3)
18	Required methods 375 (3) 468A (1) 376 (3), 468B (1) 448 (3) 468C (0 5) 449 (3) 468D (0 5), 443 (3)
3	Options Select from 447 (3) 450 (3) 451 (3) 457 (3) 475 (3) 422 (3) 477 (3) 478 (3) Sp Ed 360

3	Related courses Select from HD FS 241 (2 to 3) 367 (3) CmDis 275 (3) Thtre 359 (3) 362 (3) U St 225 (3) H S 105 (2), Psych 437 (3) Sec Ed 101 (3) 302 (3)
5	Related Methods Select from H S 275 (3) Art 211 (2) Music 265 (3) P E 284 (3)
16	Student teaching 417A (8), 417B (8)
3	**Electives**
R	Orientation (required) Freshman—115 sophomore—215 transfer—315

*Refer to departmental curriculum sheet available from adviser for specific course requirements

Special Education Option—Elementary

Total credits required 141

This option is designed for students to become licensed in elementary education and mental disabilities Students will complete the general education and professional education requirements listed under elementary education with the following courses substituted for the options related courses student teaching and electives sections of the elementary education curriculum

Cr	
32	Sp Ed 360 (3) 365 (3) 458 (2) 430 (3) 431 (3) 434 (2) 417C (8) and El Ed 417A or 417B (8)
65	General education (elementary education curriculum)
21	Required courses (elementary education curriculum)
18	Required methods (elementary education curriculum)
5	Required related methods (elementary education curriculum)

Special Education Option—Secondary

The secondary MD licensure requires a major in elementary or secondary education In addition the following courses must be completed

Cr	
27	Sp Ed 360 (3) 365 (3) 458 (2) 431 (3) 432 (3) 433 (3) 434 (2), 417D (8)

Curriculum in Industrial Education and Technology

The curriculum in industrial education and technology is planned for students preparing to enter industry The industrial technology program provides preparation for employment in business or construction maintenance or occupational safety or technical training

Total credits required 129 5-130 5

For additional information see *Index Industrial Education and Technology Courses and Programs*

Industrial Technology Major

Cr	
45 5	**General Education**
16	Biology and physical sciences mathematics Chem 163 163L Math 142 160 Phys 111
10	Social sciences Psych 101 Econ 201 Soc 134
6	Humanities Select from art foreign languages history literature, music philosophy or religion
9 5	Communication skills Engl 104 105, Sp Cm 211 Lib 160
4	Health safety physical education dance O SAF 201 1 credit in P E
6	**Electives**
18	**Technical core**
3	Introduction to Graphic Communications—IEd T 120
3	Introduction to Manufacturing Materials—IEd T 130
3	Introduction to Electrical Energy—IEd T 140
3	Introduction to Design Graphics—IEd T 224
3	Manufacturing Processes—IEd T 231
3	Fundamentals of Electronics—IEd T 240
27	**Professional**
R	Introduction to Industrial Technology—IEd T 110
3	Introduction to Training and Development—IEd T 302
3	Total Quality Improvement—IEd T 360
1-4	Industrial Internship—IEd T 481 or 380 or O Saf 481
1	Seminary in Industrial Technology—IEd T 495
3	Handling of Hazardous Materials—O Saf 315
3	Principles of Organization and Management—Mgmt 370
4	Principles of Statistics—Stat 101
3	Financial Accounting—Acct 284
3	Report and Proposal Writing—Engl 309 or Technical Communications—Engl 314
3	*Organization Communications*—ComSt 314 or Small Group Communications—ComSt 317

Students may select one of three options

Manufacturing prepares students to plan and coordinate materials machines methods and manpower in a manufacturing environment

Occupational safety prepares students to develop coordinate and evaluate the safety issues relating to people materials equipment and environments

Training and development prepares students to analyze design develop implement and evaluate training programs

Options

33	**Manufacturing Option (129 5 Cr)**
3	Computer Applications in Industrial Technology—IEd T 216
3	Industrial Electronics—IEd T 242
3	Digital Electronics—IEd T 246
3	Computer Aided Design —IEd T 326
3	Automated Manufacturing Processes—IEd T 435
3	Facility Planning—IEd T 410
3	Computer Aided Manufacturing—IEd T 435
3	*Industrial Robotics Systems*—IEd T 446
9	Select from Introduction to Graphic Reproduction—IEd T 221 Integrated/Mechanical Fluid Systems—IEd T 244 Advanced Computer Applications—IEd T 316 Descriptive Geometry—IEd T 322 Polymer and Composite Processing—IEd T 330 Solid State Industrial Electronics—IEd T 342 Statics and Strength of Materials—IEd T 423 Materials Testing and Processing—IEd T 433 Microprocessor Electronics Applications—IEd T 442
34	**Occupational Safety Option (130 5 Cr)**
3	Introduction to Occupational Safety—O Saf 202
3	Legal Aspects of Occupational Safety—O Saf 330
3	Fire Protection and Prevention—O Saf 360
3	Industrial Hygiene Chemical Hazards—O Saf 470
3	Industrial Hygiene Physical Hazards—O Saf 471
16	**Related Courses**
3	Applied Ergonomics—I E 277
3	Computer Application—Com S 103
3	Elementary Organic Chemistry—Chem 231
1	Elementary Organic Chemistry Laboratory—Chem 232A
3	Basic Human Physiology and Anatomy—Zool 155
2	First Aid and Emergency Care—H S 105
3	**Support Courses** Select from Industrial Training Needs Assessment—IEd T 303 Development of Industrial Training Curriculum—IEd T 305 Human Resource Development in Industry and Business—IEd T 306 Industrial Training Delivery Techniques—IEd T 402 Industrial Training Program Evaluation—IEd T 405 Industrial Training Media Resource Development—IEd T 406

34	**Training and Development Option (130 5 Cr)**
3	Industrial Training Needs Assessment—IEd T 303
3	Development of Industrial Training Curriculum—IEd T 305
3	Human Resource Development in Industry and Business—IEd T 306
3	Industrial Training Delivery Techniques—IEd T 402
3	Industrial Training Program Evaluation—IEd T 405
3	Industrial Training Media Resource Development—IEd T 406
16	**Related Courses**
4	Computer Application—Com S 103
3	Organizational Communication Training and Development—ComSt 414
3	Individual Behavior in Organizations—Mgmt 371
3	Principles of Marketing—Mkt 340
3	Human Factor—Psych 350 or Industrial Psychology—Psych 450

Curriculum in Community Health Education

Administered by the Department of Health and Human Performance The curriculum in community health education prepares students for professional involvement in community agencies which incorporate health services and the educational process Examples of agencies include state and local public health agencies voluntary agencies hospitals (patient education) and industry (health and wellness programs)

A minor in health studies is available, the requirements appear under *Health and Human Performance Courses and Programs*

Total credits required 128 (46 credits in courses numbered 300 or above)

Cr	
47 5	**General Education***
18	**Biological sciences, physical sciences and mathematics**
3	Principles of Biology—Biol 201
3-5	Chemistry—select from 160 163 163L 177 177L
3-4	Basic Human Physiology and Anatomy—Zool 155
2	Laboratory in Human Physiology and Anatomy—Zool 156
4	Principles of Statistics—Stat 101
3	Computer Science—Com S 103 or 107
9	**Social sciences**
3	Introduction to Psychology—Psych 101
3	Introduction to Sociology—Soc 134
3	Developmental Psychology—Psych 230
6	**Humanities***
12 5	**Communication skills**
6	Freshman Composition—Engl 104 105
3	Fundamentals of Public Speaking—Sp Cm 212
3	Business Communication—Engl 302
0 5	Library Instruction—Lib 160
2	**Health, safety, physical education, and dance***
2	Physical Fitness and Conditioning—P E 258
31	**Community health core**
2	First Aid and Emergency Care—H S 105
3	Personal and Consumer Health—H S 110
3	Drug Education—H S 215
3	Community and Public Health—H S 310
3	Human Diseases—H S 350
3	Administration of the School Health Program—H S 390
3	Community Health Program Development—H S 430
3	Health Promotion in the Community and Workplace—H S 440
8	Directed Field Experience in Health Education—H S 488
36	**Related courses**
3	Human Nutrition—FS HN 167
5	Introductory Microbiology—MI PM 202 202L
3	Individual and Family Life Development—HD FS 102
3	Death as a Part of Living—HD FS 373
3	Aging and the Family—HD FS 377
3	Principles of Accident Prevention—O Saf 201
3	Social Psychology A Sociological Perspective—Soc 305
3	Introduction to Social Policies and Social Work—So Wk 261
3	Psychology of Normal Personality—Psych 360
1	Instructional Media—SecEd 301
3	Business and Professional Speaking—Sp Cm 312
3	Institutional Public Relations—Jl MC 320
13 5	**Electives**

*Refer to the department-approved list of courses

Curriculum in Physical Education

The curriculum in physical education is planned for students preparing to teach physical education or to enter related professional areas The student majoring in physical education may select one of six options (1) physical education secondary licensure (7-12) (2) physical education secondary and elementary licensure (K-6 7-12) (3) exercise science, (4) athletic training (5) sport management or (6) general physical education studies

Minors in dance athletic training and athletic coaching are available the requirements appear under *Health and Human Performance Courses and Programs*

Total credits required 128 (46 credits in courses numbered 300 or above)

Cr	
48 5	**General Education**
14	Biological sciences physical sciences mathematics
3-4	Basic Human Physiology and Anatomy—Zool 155
2	Laboratory in Human Physiology and Anatomy—Zool 156
3	Human Nutrition—FS HN 167
3-4	Physics—select from 101 106 111
3	Computer Science—select from Com S 103 107 205 211 SecEd 101
9	**Social sciences**
3	Introduction to Psychology—Psych 101
3	Introduction to Sociology—Soc 134
3	Developmental Psychology—Psych 230
6	**Humanities** Select from classical studies history literature philosophy or religious studies Three of the 6 credits must focus on multicultural or international issues Refer to department-approved list of courses
12 5	**Communication skills**
6	Freshman Composition—Engl 104 105
3	Fundamentals of Public Speaking—Sp Cm 212
0 5	Library Instruction—Lib 160
3	English or Speech—select from Engl 204 302 314 Sp Cm 312
5	**Health, safety, physical education, and dance**
2	First Aid and Emergency Care—H S 105
3	Personal and Consumer Health—H S 110
2-3	**Environmental studies** Select from Env S 223 225, 331 382

*All teacher licensure students must complete one 3-credit course in American history or government

21	**Core requirements***
R	Physical Education Orientation—P E 250
3	History and Philosophy of Physical Education and Sport—P E 260
1	Perspectives of Physical Education—P E 255
4	Biomechanics—P E 355
3	Sociology of Sport and Physical Activity—P E 360
3	Psychology of Sport and Physical Activity—P E 365
3	Motor Learning and Control—P E 372
4	Physiology of Exercise—P E 455

*A grade of C- or better in each of the required core courses must be earned prior to graduation

Option 1 Physical Education Licensure (7-12)

This option is designed for students interested in becoming licensed to teach physical education in junior and/or senior high schools Students who are interested in *preparing to coach must earn* additional credits in the following P E 220 486 and one or more coaching theory courses selected from 301-311

27	***Professional education*** **requirements**
3	Educational Psychology—Psych 333
3	Foundations of American Education—*SecEd 204*
3	Mathematics*
1	Instructional Media—SecEd 301
R	Senior Seminar—SecEd 415
2	Multicultural Awareness and Nonsexism in the Classroom—SecEd 406
3	Principles of Secondary Education—SecEd 426
12	Supervised Teaching in Physical Education in the Secondary School—P E 417
17	**Physical education professional theory**
2	Physical Fitness and Conditioning—P E 258
1	Pre-Student Teaching Experience—SecEd 280
3	Teaching Physical Education—P E 375
2	Methods of Teaching Dance—Dance 385
3	Adapted Physical Education—P E 395
3	Evaluation in Physical Education—P E 470
3	Physical Education Curriculum Design and Program Organization—P E 475
10	**Physical education professional activity skills**
	Aquatics—P E 230
	Gymnastics Skills—P E 231
	Individual Sports—P E 233 234 235
	Team Sports—P E 232 233 234
	Dance—Dance 210 211
4 5	**Electives**

*Refer to the department approved list of courses

Option 2 Physical Education Licensure (K-8)

The K-6 physical education licensure option leads to licensure to teach physical education in both elementary and secondary schools In addition to meeting the physical education secondary licensure (7-12) requirements shown in Option 1 the following credits must be completed

3	Movement Education in Elementary School Physical Education—P E 275
1	Directed Field Experience in Elementary School Physical Education—P E 280
2	Teaching Children s Dance—*Dance 384*
3	Development and Guidance in Middle Childhood—HD FS 226
8	Supervised Teaching in Physical Education in the Elementary School—P E 418

Option 3 Exercise Science

This option prepares students for careers in the physical fitness/health field It is designed for those who wish to prepare for professional roles as exercise specialists or program directors in corporate fitness programs health clubs cardiac rehabilitation programs or other public and private agencies providing physical fitness activities

General education modifications Psych 314 or 434 must be substituted for Psych 230

Exercise Science Requirements

2	Basic Athletic Training—P E 220
2	*Physical Fitness and* Conditioning—P E 258
2	Leadership Techniques for Fitness Programs—P E 259
3	Management in the Sport Enterprise—P E *340*
R	Job Search Skills and Strategies—P E 401
2	Medical Aspects of Exercise—P E 410
3	*Physical Fitness—Principles* Programs and Evaluation—P E 458
1	Laboratory in Fitness Programs and Evaluation—P E 458L
8	Internship in Sport and Exercise Science—P E 485A
3	Health Promotion in the Community and Workplace—H S 440
	Related Courses
3	Communication with the Elderly—Sp Cm 321 or The Aged in American Society—Soc 476 or Aging and the Family—HD FS 377
3-5	Statistics—select from Stat 101 104 227
4	General Chemistry—Chem 163
1	Laboratory in General Chemistry—Chem 163L
3	Elementary Organic Chemistry—Chem 231
1	Laboratory in Elementary Organic Chemistry—Chem 232
3-6	Food Science and Human Nutrition—FS HN 260 or 360 and B B 301
14 5	**Electives**

Option 4 Athletic Training

The athletic training option prepares students for the NATA certification examination or for graduate work in athletic training Admission to the athletic training option is based on available department resources and will be determined on the basis of grades in foundation courses and other performance factors Details are available from the Physical Education Advising Office

2	Basic Athletic Training—P E 220
2	Leadership Techniques for Fitness Programs—P E 259
2	Physical Fitness and Conditioning—P E 258
4	Modalities and Rehabilitation of Athletic Injuries—P E 224
4	Evaluation of Athletic Injuries—P E 325
2	Instructor s First Aid and *Cardiopulmonary* Resuscitation—H S 305
R	Job Search Skills and Strategies—P E 401
4	Practicum in Athletic Training—P E 488
2	Coaching Theory—select one course from 301-311
3	Physical Education for the Disabled—P E 393
3	*Physical Fitness—Principles* Programs and Evaluation—P E 458
1	Laboratory in Fitness Programs and Evaluation—PE 458L
4	General Chemistry—Chem 163
1	Laboratory in General Chemistry—Chem 163L
3	Drug Education—H S 215
3	Human Diseases—H S 350
4-5	Related coursework—select from P E 340 402 410 445
3-5	Statistics—select from Stat 101 104 227
11 5	**Electives**

Option 5 Sport Management

The sport management option prepares students for a variety of sport specialist *positions in health and sport clubs* community recreation centers resorts voluntary agencies such as YM/YWCA s industry and other public and private agencies involving sports instruction *recreational sports activites and sport/fitness* management

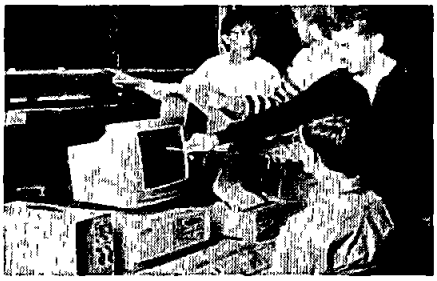
16	**Sport Management Requirements**
3	Management in the Sport Enterprise—P E 340
4	Developing and Marketing Recreation Programs—P E 350
3	Operation of Recreation Areas and Facilities—P E 352
R	Job Search Skills and Strategies—P E 401
3	Commercial Recreation—P E 435
3	Legal Aspects of Sport—P E 445
31-32	**Related Courses**
4-5	Principles of Statistics—Stat 101 or Introduction to Business Statistics—Stat 227
3	Principles of Marketing—Mkt 340
3	Principles of Organization and Management—Mgmt 370

3 Individual Behavior in Organizations—Mgmt 371
3 Legal Environment of Business—Acct 215
3 Financial Accounting—Acct 284
3 Publicity Methods—Jl MC 205
3 Advertising Principles—Jl MC 330
3 Principles of Macroeconomics—Econ 205
3 Principles of Microeconomics—Econ 206
6 Practicum
6 Internship in Sport and Exercise Science—P E 485C
5 5 Electives

Option 6 General Physical Education Studies

The general physical education studies option is planned for students who are interested in an interdisciplinary approach to the study of human movement In this option physical education is combined with a concentration in another area of study to support an individualized program such as dance sports psychology sports information and promotion and other sport related fields This option also provides preprofessional training for students who are preparing for advanced study leading to careers in physical therapy and other allied health programs

R Job Search Skills and Strategies—P E 401
6 Physical Education and/or Dance Activities
6 Physical Education Professional Courses
3-5 Statistics—select from Stat 101 104 227
26 Meet the requirements of a specialization area in a related field (area and program must be approved by the Department of Health and Human Performance a practicum may be required)
17 5 Electives



College of Engineering

David T Kao Dean and Director
Arvid R Eide Associate Dean for Instruction and Student Affairs
William Lord Associate Dean for Research and Graduate Study
George Burnet Associate Dean for Outreach and External Affairs

Departments of the College

Aerospace Engineering and Engineering Mechanics
Agricultural and Biosystems Engineering
Chemical Engineering
Civil and Construction Engineering
Electrical Engineering and Computer Engineering
Engineering Fundamentals and Multidisciplinary Design
Industrial and Manufacturing Systems Engineering
Materials Science and Engineering
Mechanical Engineering

Engineers occupy a uniquely important position in our modern civilization They have the responsibility for taking the discoveries of basic science and translating them into products structures facilities and services for society

Curricula and Administering Departments

Curriculum	Administering department	See key below					
Aerospace E	Aero E & E Mech	A	B	C	D	E	F
Agricultural E	Ag & Biosystems E	A	B	C	D	E	F
Biomedical E	Multi-departmental					E	F
Ceramic E	Materials Science & E	A		C		E	F
Chemical E	Chemical E	A	B	C	D	E	F
Civil E	Civil & Construction E	A	B	C		E	F
Computer E	Elec E & Comp E	A	B	C	D	E	F
Construction E	Civil & Construction E	A	B	C			
Electrical E	Elec E & Comp E	A	B	C	D	E	F
E Mechanics	Aero E & E Mech				D	E	F
E Operations*	Coll Supervisory Com tee	A	B				
E Science	Aero E & E Mech	A	B	C			
Industrial E	Ind & Mfg Sys E	A	B	C	D	E	F
Mechanical E	Mechanical E	A	B	C		E	F
Metallurgical E	Materials Science & E	A	B	C			
Metallurgy	Materials Science & E					E	F
Nuclear E	Mechanical E					E	F
Operations Research	Ind & Mfg Sys E					E	

Key
A Offers 4 year bachelor of science (B S) degree
B Offers 5 year bachelor of science degree (co-op program)
C Undergraduate program accredited by Engineering Accreditation Commission of ABET
D Offers master of engineering (M E) degree
E Offers master of science (M S) degree
F Offers doctor of philosophy (Ph D) degree
* This program provides for an individualized curriculum in a variety of areas (see *Index*)

Objectives of Curricula in Engineering

The engineering programs at Iowa State University are designed to develop the professional competence of a diverse student body and by breadth of study to prepare students for the practical solution of the technical problems of society while considering the ethical social and economic implications of their work Engineering education seeks to develop a capacity for objective analysis and synthesis of solution along with dedication to maintaining life-long competence

The curricula in engineering provide a balanced program in mathematics basic sciences engineering sciences engineering design and social sciences and humanities (SSH) This content is consistent with criteria of the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET) the national engineering accrediting agency

Registration as a professional engineer which is granted by the individual states is required for many types of positions The professional curricula in engineering at Iowa State University are designed to prepare a graduate for subsequent registration in all states Seniors in ABET accredited curricula of the College of Engineering are encouraged to take the Fundamentals of Engineering Examination for professional registration during their final academic year Seniors in engineering curricula who have obtained at least 6 semester credits in surveying may take the Fundamentals Examination for professional registration as land surveyors

Advanced work in engineering is offered in the post-graduate programs See the *Graduate College* section of this catalog

Organization of Curricula

All curricula in engineering are divided into two phases a basic program and a professional program The basic program consists primarily of subjects fundamental and common to all branches of engineering and includes chemistry physics mathematics engineering graphics engineering computations and English A student who has adequate high school preparation is expected to complete the basic program in one year The professional phase of a curriculum includes intensive study in the particular branch of engineering which a student chooses as well as a continuation of supporting work in mathematics basic sciences humanities and social sciences

Students must complete the requirements of the basic program before proceeding to a professional program Prior to admission to a professional program students will be considered to be in a preprofessional program

Preparation for the Engineering Curricula

High school credits particularly important to students wishing to study engineering include 2 years of algebra 1 year of geometry and ½ year of trigonometry 1 year each of chemistry and physics and 4 years of English See page 7 for specific admission requirements Placement examinations in mathematics will be given to all new students Advanced placement is possible for students with exceptional high school preparation Students who score poorly on these examinations may be encouraged or required to take remedial courses and should expect to spend more than the customary time to complete the engineering program

Basic Program for Professional Engineering Curricula

The first year program is much the same for all professional curricula in the College of Engineering Each curriculum requires completion of the basic program as well as the curriculum designated requirements The basic program is a set of core courses common to all engineering curricula while the curriculum designated requirements are courses required by individual curricula The student who desires to receive the bachelor s degree in a minimum time will find it desirable to select a curriculum as soon as possible

Entering undergraduates must demonstrate proficiency in trigonometry on the mathematics placement examination or have passed a college trigonometry course before enrolling in Math 166 Students who are not adequately prepared may have to take Math 140 141 or 142 and/or Chem 50 in addition to the courses listed below The following courses may not be used to satisfy credit requirements for graduation in any of the engineering curricula Math 140 141 142 Chem 50

The Department of English may recommend placement in one or more sections of Engl 101 because of unsatisfactory performance on the English placement test administered to students whose first language is not English These recommendations must be satisfied prior to enrollment in Engl 104 or before transfer credits accepted for Engl 104-105 can be applied toward an engineering degree

Basic Program

Cr	
8 or 10	Mathematics 165 166 or 175 176
6	English 104 105
6	Engineering 160 170
4	Chemistry 167 or 177*
5	Physics 221
R	Engineering 101
0 5	Library 160
29 5-31 5	**Total credits**

Curriculum Designated Requirements

Aerospace Engineering—SSH electives (6 cr)
Agricultural Engineering—Chem 167L (1 cr) or 177L (1 cr) *A E 110 (R cr) SSH elective (3 cr)
Ceramic Engineering—Chem 177 * 177L (1 cr) SSH elective (3 cr)
Chemical Engineering—Chem 177* 177L (1 cr) 178 (3 cr) 178L (1 cr) SSH elective (3 cr)
Civil Engineering—Chem 167L (1 cr) a course in statistics from a department-approved list (3 cr)
Computer Engineering—Com S 227 (3 cr) 228 (4 cr)
Construction Engineering—Con E 110 (R cr) Psych 101 (3 cr)
Electrical Engineering—Com S 207 (3 cr) SSH elective (3 cr)
Engineering Operations—Psych 101 (3 cr)
Engineering Science—Chem 167L (1 cr) SSH elective (3 cr)
Industrial Engineering—I E 101 (R cr) Psych 101 (3 cr) Sp Cm 212 (3 cr)
Mechanical Engineering—Chem 167L (1 cr) SSH elective (3 cr)
Metallurgical Engineering—Chem 177* 177L (1 cr) SSH elective (3 cr)

The student s adviser may require or recommend courses in addition to those specified above if the preparation and progress of the student are such that additional courses are necessary or desirable

*Students planning to enroll in A E (Biosystems Engineering Option) Ch E Cer E or Met E will find 177 to be a better preparation for Chem 178 However Chem 167 is accepted as a substitute for 177 for those students declaring one of these curricula late

Requirement for Entry into Professional Program

Students enrolled in the College of Engineering must satisfy both of the following requirements before being admitted to a professional program

1 Completion of the basic program with an average of 2 00 or better in the basic program

2 A cumulative grade average of 2 00 or better for all courses taken at Iowa State up to that time

In some engineering programs the number of students applying for admission to the professional program exceeds the number of students that can be accommodated The limitation is determined by resources—faculty and laboratory facilities The college has developed an enrollment management plan that is designed to allocate the available spaces on a basis that combines grades in the basic program courses with the amount of time the students have spent awaiting acceptance into the professional program The details are available from the College Classification Office and will be explained thoroughly during an orientation program

Engineering undergraduates must be admitted to a professional program before they may enroll in 200-level or above courses offered in the College of Engineering The only exceptions to the application of this rule are the following

a Students who have completed all of their coursework while enrolled in the College of Engineering but have not been admitted to a professional program may enroll for not more than one semester in 200-level or above courses offered by departments in the College of Engineering which have not been designated for enrollment management This exception may be extended to two semesters for students whose curriculum requires Chem 178 and 178L

b Students transferring to the College of Engineering from another college or university or from a program outside this college who do not qualify for admission to a professional program may enroll for not more than two semesters in 200-level or above courses offered by departments in the College of Engineering which have not been designated for enrollment management

c Iowa State students not pursuing an engineering degree may take engineering courses without restrictions provided they meet the prerequisites and space is available

d Only the first two semesters of 200-level and above engineering courses taken at ISU while a student is not enrolled in the College of Engineering can be applied toward an engineering degree

Students reentering the College of Engineering must have the approval of the College Academic Standards Committee

Requirement for Graduation

In order to graduate in a professional engineering curriculum a student must have a minimum GPA of 2 00 in a department-designated group of 200-level and above courses These courses will total not less than 24 nor more than 48 semester credits

Advising System

The purpose of the advising system in the College of Engineering is to work constructively with students in developing their individual academic programs and to maintain close contact with students during their college careers

The college offers an orientation program during the spring and summer for students planning to enter in the fall and during the fall for students planning to enter in the spring All entering students are encouraged to attend an orientation session Tests given at this time help determine the student s level of achievement and enable the adviser to prepare an appropriate program for the student

Undergraduate Majors and Minors Outside the College of Engineering

In addition to the engineering degree program students may earn majors or minors in other colleges of the university A major or minor program must meet all requirements of the offering department or program and its college and contain credits beyond the requirements for a B S degree in engineering A minimum of 15 additional credits is required for each major area of study and an additional 9 credits for each minor

Special Programs

Engineering College students may participate in the following undergraduate programs These programs are integrated into the professional engineering curricula and often require additional work Each individual program is developed by the student and her/his engineering adviser

a Cooperative Education Program—The College of Engineering offers through its curricula, cooperative programs in which students may gain practical experience in engineering during college years

These programs are arranged so that the academic work is taught at the university and practical experience is gained by working in industry during certain periods each year The student under a cooperative program receives experience in a chosen profession plus financial return

The employer can evaluate the student s potential as a possible future permanent employee The college gains by the engineering experiences which the cooperative student brings into the classroom

In general students under these programs will require one year more to complete the usual curriculum requirements The first contact with industry usually comes after completion of the first or second year The college does not guarantee the kind of work or wages but attempts to place students to their best educational and financial advantages

A student must observe regulations of the employer and must not expect special treatment University holidays do not apply to cooperative students nor are students allowed time off for university activities A student may not enroll in classes at any educational institution during a period of cooperative employment without university approval

Those in the cooperative program are considered by the university to be students while they are employed Such students are subject to university regulations concerning conduct during this period and are liable to dismissal from the university for misconduct on the job They may continue living in university housing during work periods

Cooperative students pay no fees to the university during work periods but may attend student activities provided they pay the activity fee

b Internship Program Most engineering curricula offer internship programs designed to encourage students to participate in engineering work experiences

c Honors Program The College of Engineering participates in the University Honors Program (see *Index*) In summary the Honors Program is designed for students with above average ability who wish to individualize their programs of study For further details consult the chair of the Engineering College Honors Program Committee or your departmental Honors Program adviser

Curriculum in Aerospace Engineering

Administered by the Department of Aerospace Engineering and Engineering Mechanics

Leading to the degree bachelor of science Total credits required 135 See also *Basic Program* and *Cooperative Programs*

Professional Program

Sophomore Year

Cr	Fall
4	Elementary Multivariable Calculus—Math 265
5	Introduction to Classical Physics II—Phys 222
3	Statics of Engineering—E M 274
3	Aerodynamics I—Aer E 241*
3	Numerical Methods and FORTRAN Programming—Aer E 215*
18	

Cr	Spring
4	Elementary Differential Equations and Laplace Transforms—Math 267
3	Mechanics of Materials—E M 324
3	Dynamics—E M 345
3	Aerodynamics II—Aer E 242*
1	Aerospace Laboratory I—Aer E 271
3	SSH elective[1]
17	

Junior Year

Cr	Fall
3	Aerodynamic Theory I—Aer E 341*
1	Aerodynamics Laboratory—Aer E 341L
3	Astrodynamics I—Aer E 351*
3	Flight Structures Analysis—Aer E 321*
1	Structures Laboratory I—Aer E 321L
4	Engineering Thermodynamics I—M E 331
3	Materials for Aerospace Applications—M S E 371
18	

Cr	Spring
3	Aerodynamic Theory II—Aer E 342*
3	Flight Vehicle Stability and Control—Aer E 355*
R	Flight Experience—Aer E 301
0 5	Gas Dynamics Laboratory—Aer E 342L
3	Advanced Flight Structures—Aer E 421*
3	Analytical Techniques for Aerospace Design—Aer E 361*
3	SSH elective[1]
15 5	

Senior Year

Cr	Fall
3	Aerospace Vehicle Propulsion I—Aer E 411*
3	Technical elective[2]
3	Flight Control Systems I—Aer E 431*
3	Design and Analysis I—Aer E 461*
R	Aerospace Seminar—Aer E 491
4	SSH elective[1]
16	

Cr	Spring
3	Design and Analysis II—Aer E 462
R	Aerospace Seminar—Aer E 492
8	Technical electives[2]
4	Introduction to Circuits Instruments and Electronics—E E 441
15	

English Proficiency
The department requires a grade of C (2 0) or better in Engl 104 and 105 to be eligible for English Proficiency Certification Students satisfying this requirement who are not cited for deficiencies in reports, laboratory reports or other writings required in other courses are certified during the semester prior to their semester of graduation Students not satisfying these requirements are referred to the department s Academic Standards Committee for corrective action

[1]The social sciences and humanities (SSH) electives are to be selected from the department approved list of courses Not to be taken under the P NP policy

[2]Technical electives are of four types (1) mathematics 3 credits (2) physics 3 credits (3) aerospace 3 credits and (4) senior elective 2 credits At least one course must be chosen from department-approved lists for each type These courses are not to be taken under the P NP policy

*Core professional curriculum A student must have a minimum grade point average of 2 00 in this group of courses in order to graduate

Curriculum in Agricultural Engineering

Administered by the Department of Agricultural and Biosystems Engineering

With options in process engineering agricultural power and machinery structures and environment water and environment biosystems engineering and food engineering Administered jointly by the College of Agriculture and the College of Engineering Leading to the degree bachelor of science Total credits required 133 5 See also *Basic Program* and *Cooperative Programs*

Sophomore Year

Cr	Fall
3	Statics of Engineering—E M 274*
4	Elementary Multivariable Calculus—Math 265*
5	Introduction to Classical Physics II—Phys 222*
3	Introduction to Statistics for Engineers—Stat 105*
15	

Cr	Spring
3	Environmental Engineering for Grain and Animal Systems—A E 214*
3	Mechanics of Materials—E M 324*
1	Mechanics of Materials Laboratory—E M 327*
4	Principles of Economics—Econ 201
3	Elementary Differential Equations—Math 266*
3	Option requirement[2]
17	

Junior Year

Cr	Fall
4	Computer Applications and Systems Modeling—A E 303*
3	Agri-Industrial Applications of Electric Power—A E 363*
3	Thermodynamics—M E 330*
3	Communications requirement[3]
4	Option requirement[2]
17	

Cr	Spring
12	Option requirements[2]
3	SSH elective[1]
15	

Senior Year

Cr	Fall
R	Senior Seminar—A E 401
1	Agricultural Engineering Design I—A E 445
2	Computer-Aided Graphics for Structural and Mechanical Design—A E 479
3	SSH elective[1]
3	Natural Resource Conservation Engineering—A E 422
9	Option requirements[2]
18	

Cr	Spring
3	Agricultural Engineering Design II—A E 446
3	SSH elective[1]
12	Option requirements[2]
18	

English Proficiency
The department requires a grade of C or better in Engl 104 and 105 (or 105H) and a grade of C or better in the course taken to meet the communication requirement

[1]Social sciences and humanities (SSH) electives are to be chosen from the department approved list The courses chosen must meet ABET and departmental requirements

[2]In the junior and senior years each student elects one of the options and takes the courses listed for the selected option The elective courses must be selected to meet ABET requirements

[3]One course must be taken from Sp Cm 212 Engl 309 Engl 314

*Core professional curriculum A student must have a minimum grade-point average of 2 00 in this group of courses in order to graduate

Options

Process Engineering—A E 213 342 422 478 Cpr E 280 440 E M 345 378 M E 440 6 credits in biological and natural resource science from a department-approved list and 9 credits from A E 503 504 551 569 571 572 C E 326 Econ 335

Agricultural Power and Machinery—A E 213 342 413 422 447 478 E E 441 E M 345 378 Math 268 M E 310 321 416 M S E 201 6 credits in biological and natural resource science from department-approved list

Structures and Environment—A E 213 342 422 478 C E 332 334 E E 441 E M 345 378 M E 440 6 credits biological and natural resource science from department-approved list and 6 credits from A E 504 571 572 C E 333 M E 436 441

Water and Environment—A E 213 422 478 Agron 154 Biol 109 Bot 310, Chem 231 232 C E 326 360 372 E M 378 M E 440 MIPM 202 and 2 credits from A E 520 522 Agron 318 340 354 577 578 C E 332 334 521

Food Engineering—B B 221 Biol 109 C E 326 Ch E 356 357 Cpr E 280 E M 345 FS HN 101 311 421 471 MIPM 202 one course from A E 569 FS HN 273 372 and 4 credits from A E 478 551 C E 326 Ch E 358 Cpr E 440 M E 441

Biosystems Engineering—B B 301 451 Biol 109 Ch E 356 357 415 C E 326 Chem 178 231 232 E M 345 Gen 330 MIPM 202 and 7 credits from A E 520 551 569 572 B M E 525 C E 372 521 Ch E 358 382 E E 441 M E 441

Curriculum in Ceramic Engineering

Administered by the Department of Materials Science and Engineering

Leading to the degree bachelor of science
Total credits required 130 5 See also *Basic Program*

Professional Program

Sophomore Year

Cr	Fall
2	Principles of Materials Science—M S E 201*
2	Introduction to Ceramic Materials—M S E 205
5	Introduction to Classical Physics II—Phys 222
4	Elementary Multivariable Calculus—Math 265
3	General Chemistry—Chem 178
1	Laboratory in General Chemistry—Chem 178L
R	Seminar—M S E 210
17	

Cr	Spring
3	Processing and Fabrication of Materials—M S E 202*
3	Elementary Differential Equations—Math 266
3	Statics of Engineering—E M 274*
2	Ceramics Processing and Fabrication Laboratory—M S E 206
R	Seminar—M S E 211
4	SSH elective[1]
15	

Junior Year

Cr	Fall
3	Instruments for Materials Characterization—M S E 315*
3	Thermochemistry for Materials Science and Engineering—M S E 360*
4	Kinetics of Microstructure Development—M S E 305*
3	Mechanics of Materials—E M 324*
4	Electronic Properties of Materials—M S E 343*
R	Seminar—M S E 310
17	

Cr	Spring
3	Pyrometry and Thermal Processing of Ceramics—M S E 307*
2	Pyrometry and Thermal Processing Laboratory—M S E 307L*
3	Vitreous State—M S E 347*
1	Vitreous State Laboratory—M S E 347L*
2	Applications of Statistics to Materials—M S E 341*
3	Mechanical Behavior of Materials—M S E 405*
3	Technical Communication—Engl 314
R	Seminar—M S E 311
R	Inspection Trip—M S E 340
17	

Senior Year

Cr	Fall
3	Manufacture and Application of Refractories and Structural Ceramics—M S E 441*
3	Design for Thermal Processing—M S E 420*
6	Technical elective[2]
4	Introduction to Circuits Instruments and Electronics—E E 441
R	Seminar—M S E 410
16	

Cr	Spring
3	Ceramic Engineering Design—M S E 422*
3	Technical elective[2]
9	SSH electives[1]
R	Seminar—M S E 411
15	

English Proficiency
The Department of Materials Science and Engineering requires a grade of C or better in Engl 104 and 105 and in one additional 3-credit course in written communication from an approved list The current list is Engl 204 302 303 314 and 415 or their equivalents

[1]Social sciences and humanities (SSH) electives must be department approved

[2]Technical electives must be department approved

*Core professional curriculum A student must have a minimum grade-point average of 2 00 in this group of courses in order to graduate

Curriculum in Chemical Engineering

Leading to the degree bachelor of science
Total credits required 134 5 See also *Basic Program* and *Cooperative Programs*

Professional Program

Sophomore Year

Cr	Fall
3	Material and Energy Balances—Ch E 210*
4	Elementary Multivariable Calculus—Math 265
5	Introduction to Classical Physics I—Phys 221
3	SSH electives[1]
15	

Cr	Spring
3	Momentum Transport Operations—Ch E 356*
3	Design Analysis Laboratory—Ch E 230*
4	Elementary Differential Equations and Laplace Transforms—Math 267
5	Introduction to Classical Physics II—Phys 222
3	SSH elective[1]
18	

Junior Year

Cr	Fall
3	Heat and Mass Transfer—Ch E 357*
4	Chemical Engineering Thermodynamics—Ch E 381*
1	Chemical Engineering Laboratory I—Ch E 324*
3	Physical Chemistry for Engineers I—Chem 321
3	Organic Chemistry—Chem 331
3	SSH elective[1]
17	

Cr	Spring
R	Seminar—Ch E 302
4	Mass Transfer Operations—Ch E 358*
1	Chemical Engineering Laboratory II—Ch E 325*
3	Chemical Reactor Design—Ch E 382*
3	Organic Chemistry—Chem 332
3	Physical Chemistry for Engineers II—Chem 322
3	SSH elective[1]
17	

Senior Year

Cr	Fall
R	Seminar—Ch E 401
2	Chemical Engineering Laboratory III—Ch E 426*
3	Process Control—Ch E 421*
4	Fundamentals of Mechanics—E M 301
3	Professional electives[2]
3	Technical Communication—Engl 314
3	Professional elective[3]
18	

Cr	Spring
4	Process and Plant Design—Ch E 430*
6	Professional electives[2]
4	Introduction to Circuits Instruments and Electronics—E E 441
3	SSH elective[1]
17	

English Proficiency
The department requires satisfactory completion of Engl 104 105 (or 105H) and 314

[1]Selected from list of department approved social sciences and humanities (SSH) courses

[2]Selected from Ch E 410 415 or 443

[3]Selected to develop a professional emphasis subject to departmental restrictions

*Core professional curriculum A student must have a minimum grade point average of 2 00 in this group of courses in order to graduate

Curriculum in Civil Engineering

Administered by the Department of Civil and Construction Engineering

Leading to the degree bachelor of science
Total credits required 134 5 See also *Basic Program* and *Cooperative Programs*

For those interested in construction engineering a curriculum is provided which leads to the degree bachelor of science in construction engineering For particulars see *Curriculum in Construction Engineering*

Sophomore Year

Cr	Fall
4	Elementary Multivariable Calculus—Math 265
5	Introduction to Classical Physics II—Phys 222
3	Fundamentals of Surveying I—C E 211
5	Statics and Dynamics—E M 307*
17	

Cr	Spring
3	Elementary Differential Equations—Math 266
1	The Practice of Civil Engineering—C E 295
3	Mechanics of Materials—E M 324*
1	Mechanics of Materials Laboratory—E M 327
3	Geology for Engineers—Geol 201
6	Electives[1]
17	

Junior Year

Cr	Fall
3	Principles of Environmental Engineering—C E 326
3	Structural Analysis I—C E 332*
3	Mechanics of Fluids—E M 378*
3	Soil Engineering—C E 360*
2	Analysis for Engineering Economy—I E 304
3	Elective[1]
17	

Cr	Spring
3	Structural Steel Design I—C E 333
3	Introduction to Transportation Engineering—C E 352*
3	Design of Concretes and Pavement Structures—C E 382
4	Engineering Hydrology and Hydraulics—C E 372*
4	Elective[1]
17	

Senior Year

Cr	Fall
3	Reinforced Concrete Design I—C E 334
3	Highway Design—C E 452
3	Engineering Design—C E 486
8	Electives[1]
17	

Cr	Spring
3	Construction or management elective[1]
13	Electives[1]
16	

English Proficiency
Students receiving a grade of C or better in Engl 104 and 105 meet the proficiency requirement of the department Students not meeting this condition must fulfill an advanced composition requirement specified in the *Departmental Student Guide*

[1]Shall be chosen from department and curriculum approved lists Electives shall include (1) 16 credits of social sciences or humanities studies (2) 6 credits of engineering science (3) 9 credits of technical elective including at least one course taken in civil engineering which has a minimum of 2 credits of design experience (4) 3 credits of communications elective The construction or management electives must be selected in construction engineering economics psychology business and/or industrial engineering Students appointed to advanced ROTC may substitute 3 credits of advanced ROTC for 3 credits of technical electives

*Core professional curriculum A student must have a minimum grade-point average of 2 00 in this group of courses in order to graduate

Curriculum in Computer Engineering

Administered by the Department of Electrical Engineering and Computer Engineering

Leading to the degree bachelor of science Total credits required 129 5 See also *Basic Program* and *Cooperative Programs*

Sophomore Year

Cr	First Semester
3	Introduction to Digital Techniques—Cpr E 280*
4	Elementary Multivariable Calculus—Math 265 or Linear Algebra Multivariable Calculus and Differential Equations—Math 270
5	Introduction to Classical Physics II—Phys 222
3	SSH elective[1]
R	Professional Programs Orientation—E E 261
15	

Cr	Second Semester
3	Electric Circuits I—E E 205*
2	Electrical Instrumentation and Experimentation—E E 235*
3	Introduction to Digital Systems Design—Cpr E 281*
4	Introduction to Computer Architecture and Machine Level Programming—Cpr E 321*
4	Elementary Differential Equations and Laplace Transforms—Math 267 or Linear Algebra Multivariable Calculus and Differential Equations—Math 371
16	

Junior Year

Cr	First Semester
3	Computer Organization and Design I—Cpr E 384*
4	Electronics I—E E 330*
3	Elementary Electromagnetics I—E E 212*
4	File Organization and Processing—Com S 361*
3	Electric Circuits II—E E 206*
17	

Cr	Second Semester
3	Theoretical Foundations of Computer Engineering—Cpr E 310*
4	Introduction to the Design of Computer-Based Systems—Cpr E 389*
4	Digital Integrated Circuits—E E 436*
6	SSH electives[1]
17	

Senior Year

Cr	First Semester
2	Digital Systems Design Laboratory I—Cpr E 481
3	Technical Communication—Engl 314
3	Technical elective[2]
3	Engineering science elective[3]
3	Mathematics elective[4]
3	SSH elective[1]
17	

Cr	Second Semester
2	Digital Systems Design Laboratory II—Cpr E 482
3	Technical elective[2]
6	SSH electives[1]
11	

English Proficiency
The department requires a grade of C or better in Engl 104 105 (or 105H) and 314

[1]Social sciences and humanities (SSH) electives must be chosen from a list of courses and sequences of courses approved by the department pass/not pass credit not accepted

[2]Technical electives must be chosen to satisfy departmental requirements concerning content distribution level and the engineering science and engineering design requirements All technical electives must be chosen from a list approved by the department Details are available in the departmental Undergraduate Advising Center and on CYNET Pass/not pass credit not accepted Six credits of technical electives are required This number may be increased by one credit depending on the mathematics elective (see below)

[3]Engineering science elective must be chosen from a list approved by the department pass/not pass credit not accepted This elective must be from another engineering department

[4]If a student has completed the Math 175 176 270 and 371 series then the mathematics elective requirement is satisfied by the two extra credits of Math 175 176 plus one additional technical elective credit Otherwise a student must choose one of the following math courses (pass/not pass credit not accepted) Math 307 471 473 or 481

*Core professional curriculum A student must have a minimum grade point average of 2 00 in this group of courses in order to graduate

Curriculum in Construction Engineering

Administered by the Department of Civil and Construction Engineering

Leading to the degree bachelor of science Total credits required 134 5 Building emphasis 134 5 Heavy emphasis, 135 5 Mechanical emphasis See also *Basic Program* and *Cooperative Programs*

Sophomore Year

Cr	Fall
3	Fundamentals of Surveying—C E 211
4	Contractor Organization and Management of Construction—Con E 221
4	Elementary Multivariable Calculus—Math 265
5	Introduction to Classical Physics II—Phys 222
2	Basic science elective (M)
16	B 16 H 18 M

Cr	Spring
3	Construction Contract Documents—Con E 245
4	Principles of Economics—Econ 201 (M)
3	Statics of Engineering—E M 274*
3	Geology for Engineers—Geol 201 (B H)
3	Construction Materials and Methods—Con E 241
3	Elementary Differential Equations—Math 266
3	Fundamentals of Public Speaking—Sp Cm 212 (B H)
18	B 18 H 16 M

Junior Year

Cr	Fall
3	Business Communication—Engl 302 (B H)
4	Principles of Economics—Econ 201 (B)
3	Mechanics of Materials—E M 324*
3	Fundamentals of Public Speaking—Sp Cm 212 (M)
3	Financial Accounting—Acct 284
4	Engineering Thermodynamics I—M E 331*(M)
3	Soil Engineering—C E 360* (B H)
3	Principles of Environmental Engineering—C E 326 (H)
3	Mechanics of Fluids—E M 378 (H M)
2	Engineering Materials—E M 336 (B, M)
18	B 18 H 18 M

Cr	Spring
3	Structural Analysis I—C E 332* (B H)
3	Concrete and Steel Construction— Con E 340 (B H)
3	Construction Equipment and Heavy Construction Methods—Con E 322* (B H)
2	Engineering Materials—E M 336 (H)
1	Mechanics of Materials Lab—E M 327
3	Engineering Law—Engr 380*
3	Mechanics of Fluids—E M 378* (M)
3	Business Communication—Engl 302 (M)
1	Design of PC Concrete—C E 383L (B M)
3	Engineering design elective (M)[1]
3	SSH elective[2]
3	Engl 302 (M)
17	B 18 H 17 M

Senior Year

Cr	Fall
3	Structural Steel Design I—C E 333 (B H)
1	Professional Development—Con E 410
3	Construction Estimating—Con E 421*
4	Introduction to Circuits Instruments and Electronics—E E 441 (B M)
3	*Elements of Heat Transfer*—M E 336* or Heat Transfer—M E 436* (M)
3	Fundamentals of Heating Ventilating and Air Conditioning—M E 441* (M)
3	Mechanics of Fluids—E M 378*(B)
3	Design of Concretes and Pavement Structures—C E 382 (H)
3	SSH elective[2]
4	Principles of Economics—Econ 201 (H)
17	B 17 H 17 M

Cr	Spring
3	Reinforced Concrete Design I—C E 334 (B H)
3	Foundations—C E 460 (H)
3	Construction Planning Scheduling and Control—Con E 441
2	Introduction to Electric Machinery—E E 447 (M)
4	Principles of Heating and Air Conditioning—M E 440 (B)
3	Heating and Air Conditioning Design—M E 442 (M)
3	Engineering design elective (M)[1]
3	SSH elective[2]
3	Business management elective[1]
16	B 15 H 17M

English Proficiency
All English courses taken including those in the Basic Program require a grade of C or better A C– grade or less requires additional composition coursework

B - Building construction emphasis
H Heavy construction emphasis
M - Mechanical construction emphasis
Undesignated courses are for all emphases

[1]Chosen from curriculum approved lists All electives must be taken for a grade Pass Not Pass grades are not acceptable

[2]Social sciences and humanities (SSH) electives chosen from curriculum approved list One of these must have a prerequisite of Psych 101 Econ 201 or a previously taken social sciences and humanities elective

[3]All electives must be taken for a grade Pass/not pass grades are not acceptable

*Core professional curriculum A student must have a minimum grade point average of 2 00 in this group of courses in order to graduate

Curriculum in Electrical Engineering

Administered by the Department of Electrical Engineering and Computer Engineering

Leading to the degree bachelor of science Total credits required 133 5 See also *Basic Program* and *Cooperative Programs*

Sophomore Year

Cr	First Semester
3	Electric Circuits I—E E 205*
2	Electrical Instrumentation and Experimentation—E E 235*
3	Introduction to Digital Techniques—Cpr E 280*
4	Elementary Multivariable Calculus—Math 265 or Linear Algebra Multivariable Calculus and Differential Equations—Math 270
5	Introduction to Classical Physics II—Phys 222
R	Professional Programs Orientation—E E 261
17	

Cr	Second Semester
3	*Electric Circuits II*—E E 206*
3	Engineering science elective[3]
4	Electronics I—E E 330*
4	Elementary Differential Equations and Laplace Transforms—Math 267 or Linear Algebra Multivariable Calculus and Differential Equations—Math 371
3	SSH elective[1]
17	

Junior Year

Cr	First Semester
3	Elementary Electromagnetics I—E E 212*
4	Electronics II—E E 331*
4	Linear Systems Continuous-Time and Discrete-Time—E E 374*
4	Intermediate Engineering Mathematics—Math 395
3	SSH elective[1]
18	

Cr	Second Semester
4	Electromagnetic Devices and Electric Machinery—E E 351*
3	Electric Network Design—E E 309*
3	Elementary Modern Physics—Phys 324
4	Elementary Electromagnetics II—E E 313*
3	SSH elective[1]
17	

Senior Year

Cr	First Semester
3	Probability and Statistics for Electrical and Computer Engineers—Stat 333
3	Technical Communication—Engl 314
5	Technical electives[2]
3	SSH elective[1]
14	

Cr	Second Semester
3	Introduction to Scientific Computation—Math 473
9	Technical electives[2]
3	SSH elective[1]
15	

English Proficiency
The department requires a grade of C or better in Engl 104 105 (or 105H) and 314

[1]Social sciences and humanities (SSH) electives must be chosen from a list of courses and sequences of courses approved by the department pass/not pass credit not accepted

[2]Technical electives are of two types (1) courses in computer engineering and electrical engineering and (2) other courses in engineering and science All technical electives must be chosen from lists approved by the department Technical electives must be chosen to satisfy departmental requirements concerning content distribution level and the engineering science and engineering design requirements The student must choose at least one course that is primarily design and that will provide a significant and meaningful design experience as required by the Engineering Accreditation Commission of A B E T Details are available in the departmental Undergraduate Advising Center and on CYNET Pass/not pass credit not accepted

[3]*Engineering science elective must be chosen from* a list approved by the department pass/not pass credit not accepted This elective must be from another engineering department

*Core professional curriculum A student must have a minimum grade point average of 2 00 in this group of courses in order to graduate

Curriculum in Engineering Operations

Administered by a supervisory committee **appointed by the dean of the College of Engineering, L Northup, chair, K Brewer, R Danofsky, E Jones, L Sturges**

Leading to the degree bachelor of science Total credits required 124 5 Additional credits required for some specializations See also *Basic Program* and *Cooperative Program*

In this era of rapid technological change there is an expanding need for persons with an engineering background Engineering operations is specifically designed to develop this background by merging several engineering disciplines or by combining engineering with other disciplines

The curriculum consists of a basic core of required courses in the sciences engineering and mathematics to which are added elective courses in the categories of engineering analysis social sciences and humanities (SSH) supporting and professional subjects Within this framework students may specialize toward specific educational or professional objectives of their choice In the course of achieving individual student s objectives the total credits may well exceed the minimum requirements of 124 5

Prior to entering the engineering operations program the student must have completed the basic program and have presented a description of the professional objective to be achieved through the program to the chair of the supervisory committee for approval In addition the student must submit a schedule of courses to support this objective Until admitted to the program students will be considered to be pre-engineering or in a pre-professional or professional program of another curriculum

Program Requirements

Cr	
	Basic Program
29 5	See Engineering Basic Program
	Math/Basic Sciences
7	Math 265 266
5	Phys 222
12	Total
	Engineering Operations Core*
3	E M 274
4 (3)	Select one Stat 231 305 333
4	E E 441
6	Select two E M 324 345 M E 330
18	Select 200-level and above engineering courses to support program objectives
35 (34)	Total
	SSH Program
3	Psych 101
4	Econ 201
9	Select from approved list**
16	Total
	Supporting
3	Acct 284
3	Engr 380 or Acct 215
3	Sp Cm 212
3	Engl 314 or 302
8 (9)	Select courses to strengthen program objectives or to serve as prerequisites for courses in other groups
20 (21)	Total
	Professional
12	Select 300-level and above courses to support professional objectives

English Proficiency
Engineering operations (except engineering journalism) students must earn a grade of C (not C–) or higher in each of Sp Cm 212 and Engl 301 or 314 Students in the engineering journalism specialization must satisfy the requirement stated in the section *Engineering Journalism*

*Core professional curriculum A student must have a minimum grade point average of 2 00 in this group of courses in order to graduate

**Social sciences and humanities (SSH) electives must be chosen from a list of courses and sequences of courses approved by the supervisory committee Pass/not pass credit is not accepted

Specializations

Selected specializations available in engineering operations are listed below Students are encouraged to propose other programs to meet individual professional objectives

A Engineering Journalism (133 5 credits)

A program in engineering journalism has been designed in the engineering operations curriculum for students who desire a knowledge of the fundamentals of engineering, science communications and human behavior and who do not wish to pursue the more specialized engineering curricula Graduates of this program should find interesting opportunities in a number of administrative areas in industry such as technical information industrial communications public relations engineering sales procurement and production

National journalism accreditation standards require a minimum of 90 semester credit hours in courses outside journalism with no fewer than 65 semester credits in the liberal arts and sciences See your adviser for further information

Additional information concerning the journalism courses and requirements may be obtained from the chair of the Department of Journalism and Mass Communication Required courses in the engineering journalism program include all the required courses in the engineering operations curriculum except as noted below

The following number of credits in journalism must be included for the engineering journalism program

I Basic Core Courses

Cr	
3	Mass Media and Society—Jl MC 101
R	Orientation to Journalism and Mass Communication—Jl MC 110
3	Reporting and Writing for the Mass Media—Jl MC 201
3	Advanced Reporting and Writing for the Mass Media—Jl MC 202
3	Law of Communication—Jl MC 460
1	Professional Media Seminar—Jl MC 492 493 494 495 or 496
3	Professional Media Experience—Jl MC 499
16	

II Skills Courses

Students must select a minimum of 11 credits of 300-level courses according to their area of specialization One of the courses selected must come from the following group Jl MC 321 334 344, 346 347 349 350 The remainder may be taken from the above courses or from any other 300-level journalism courses

III Advanced Courses

Students must select a minimum of 6 credits of 400-level courses in addition to those required in the basic core One of these 400-level courses must come from the following group Jl MC 401 461 462 464 and 476 The remainder may be taken from the above courses or from any other 400-level courses except 490 492 493 494, 495 496 or 499 Students in consultation with their advisers should select courses which complement their areas of specialization

A 400-level journalism course preferably 460 may be substituted for Engr 380 and a 300-level course preferably 347 for Engl 314 Two courses selected from 461 462 464 474 and 476 may be taken as social sciences and humanities electives and four other 300- and 400-level courses as supporting electives

English proficiency requirement The Department of Journalism and Mass Communication requires a grade of C+ or better in the following courses (unless exempted by waiver or test-out) Engl 104, 105 (or 105H) Jl MC 201 and 202 or 203 Students who attain a grade of C in one of the four required courses can achieve English proficiency by earning a grade of C+ or better in one of the following courses in Jl MC 321 334 344 346 347 349 or 352

B Engineering Management (133 5 credits)

A degree in engineering combined with a minor in business (See *College of Business* for minor requirements)

C Environmental Engineering

A program to emphasize environmental applications of engineering

D Health Technology

Applications of engineering to health fields

E Nuclear Power Plant Operations

A program specifically designed for current nuclear power plant operators

F Officer Education

A program in cooperation with Air Force Aerospace Studies, Naval Science and Military Science A minor is possible in Naval Science See *Officer Education Programs*

G Technical Sales

A program providing preparation for selling products of a technical nature and consulting with the manufacturer and the industrial consumer to solve engineering problems

H Technical Systems Administration
A program designed for those planning to enter technical administration in public agencies (e g , city managers or county administrators)

I Other
A program may be planned by the individual student subject to approval by the supervisory committee Distance learning program proposals will be considered

Curriculum in Engineering Science

Administered by the Department of Aerospace Engineering and Engineering Mechanics

Leading to the degree bachelor of science Total credits required 135 5 See also *Basic Program* and *Cooperative Programs*

Sophomore Year

Cr	Fall
4	Elementary Multivariable Calculus—Math 265*
5	Introduction to Classical Physics II—Phys 222
3	Statics of Engineering—E M 274*
3	Electric Circuits I—E E 205*
2	Electrical Instrumentation and Experimentation—E E 235*
R	Engineering Science Seminar—E Sci 410
17	

Cr	Spring
4	Elementary Differential Equations and Laplace Transforms—Math 267*
3	Physical science elective[1]
3	Mechanics of Materials—E M 324*
1	Mechanics of Materials Laboratory—E M 327
3	Communications skills elective[2]
4	Electronics I—E E 330*
R	Engineering Science Seminar—E Sci 410
18	

Junior Year

Cr	Fall
4	Probability and Statistical Inference for Engineers—Stat 231
3	Introduction to Partial Differential Equations—Math 385*
2	Principles of Materials Science—M S E 201*
2	Introductory Physical Metallurgy Laboratory—M S E 205* or 207*
3	Dynamics—E M 345*
3	SSH elective[3]
R	Engineering Science Seminar—E Sci 410
17	

Cr	Spring
3	Mechanics of Fluids—E M 378*
3	Experimental Methods in Engineering Science and Mechanics—E Sci 382
3	Depth/technical elective[1,4]
3	SSH elective[3]
4	Engineering Thermodynamics I—M E 331*
R	Engineering Science Seminar—E Sci 410
16	

Senior Year

Cr	Fall
3	Numerical Solution of Differential Equations and Interpolation—Math 481
3	Heat Transfer—M E 436*
6	Depth/technical elective[1,4]
2	Senior Engineering Science Design Project I—E Sci 481
3	SSH elective[3]
R	Engineering Science Seminar—E Sci 410
17	

Cr	Spring
3	Mathematics elective[1]
6	Depth/technical elective[1,4]
4	SSH elective[3]
4	Senior Engineering Science Design Project II—E Sci 482
R	Engineering Science Seminar—E Sci 410
17	

English Proficiency
The department requires a grade of C (2 0) or better in Engl 104 and 105 to be eligible for English Proficiency Certification Students satisfying this requirement who are not cited for deficiencies in reports laboratory reports or other writings required in other courses are certified during the semester prior to their semester of graduation Students not satisfying these requirements are referred to the department s Academic Standards Committee for corrective action

[1]See department lists for approved mathematics electives physical science electives and technical electives

[2]Any of the following courses are acceptable for satisfying the communications skills elective Engl 204 220 302 309 314 415 Sp Cm 212

[3]These electives are to be chosen from the department approved list of social sciences and humanities (SSH) courses At least one sequence consisting of two or three courses is required as part of the 16 credits of social sciences and humanities electives In addition at least 6 credits of the required 16 must be in the humanities (art English foreign languages history philosophy music or religion)

[4]Each student must develop an area of specialization in consultation with an academic adviser This will be accomplished by taking two elective courses in the selected area of specialization See department list for suggested lists of courses A portion of each student s required 16 credit hours of design will be associated with these electives

*Core professional curriculum A student must have a minimum grade-point average of 2 00 in this group of courses in order to graduate

Curriculum in Industrial Engineering

Administered by the Department of Industrial and Manufacturing Systems Engineering

Leading to the degree bachelor of science Total credits required 131 5 See also *Basic Program* and *Cooperative Programs*

Sophomore Year

Cr	Fall
4	Probability and Statistical Inference for Engineers—Stat 231
4	Elementary Multivariable Calculus—Math 265
5	Introduction to Classical Physics II—Phys 222
3	Engineering Economy—I E 205*
1	Engineering Software Tools I—Engr 262
1	Engineering Software Tools II—Engr 263
18	

Cr	Spring
3	Materials Science and Engineering—M S E 271
3	Applied Ergonomics—I E 277*
4	Principles of Economics—Econ 201
4	Elementary Differential Equations and Laplace Transforms—Math 267
3	Statics of Engineering—E M 274
17	

Junior Year

Cr	Fall
3	Quality Control—I E 361*
3	Methods Engineering and Work Measurement—I E 373*
3	SSH elective[1]
3	Optimization—I E 312*
3	Dynamics—E M 345
15	

Cr	Spring
3	Industrial Methodology—I E 374*
4	Introduction to Circuits Instruments and Electronics—E E 441
3	Stochastic Analysis—I E 313*
3	Technical Communication—Engl 314
3	Mechanics of Materials—E M 324
16	

Senior Year

Cr	Fall
3	Industrial Engineering Design—I E 441*
3	Material and Project Control—I E 341*
3	Thermodynamics—M E 330
3	Manufacturing Systems Modeling—I E 419*
3	Industrial Materials Handling—I E 443*
15	

Cr	Spring
9	Industrial engineering electives[1]
6	SSH electives[2]
15	

English Proficiency
The department requires a C grade (2 0) or better in Engl 104 and 105

*Core professional curriculum A student must have a minimum grade point average of 2 00 in this group of courses in order to graduate

[1]These electives are to be chosen from department authorized lists with advance approval Pass-not pass credit not accepted

[2]These social sciences and humanities (SSH) electives must be chosen from a department-approved list and must include at least one 6-credit sequence of prerequisite or related courses The sequence can include Psych 101 or Econ 201 No more than one 100-level course is to be included except approved foreign language sequence Three credits pass not pass accepted except for Econ 201 Psych 101

Curriculum in Mechanical Engineering

Leading to the degree bachelor of science
Total credits required 133 5 See also *Basic Program* and *Cooperative Programs*

Sophomore Year

Cr	First Semester
4	Elementary Multivariable Calculus—Math 265
5	Introduction to Classical Physics II—Phys 222
3	Statics of Engineering—E M 274
4	SSH electives[1]
16	

Cr	Second Semester
4	Elementary Differential Equations and Laplace Transforms—Math 267
3	Dynamics—E M 345*
3	Mechanics of Materials—E M 324*
2	Principles of Materials Science—M S E 201*
3	Engineering Statistics—Stat 305
15	

Junior Year

Cr	First Semester
3	Mechanical Behavior of Materials—M E 321*
4	Engineering Thermodynamics I—M E 331*
4	Introduction to Circuits Instruments and Electronics—E E 441*
3	SSH elective[1]
4	Mechanisms—M E 310*
18	

Cr	Second Semester
3	Mechanical Systems—M E 311*
3	Manufacturing Processes—M E 322*
3	Engineering Thermodynamics II—M E 332*
3	Fluid Flow—M E 335*
2	Introduction to Electric Machinery—E E 447
3	Technical Communication—Engl 314
R	Mechanical Engineering Seminar—M E 302
17	

Senior Year

Cr	First Semester
3	Design of Machine Elements I—M E 416*
3	Engineering Measurements and Instrumentation—M E 360*
3	Heat Transfer—M E 436*
3	SSH elective[1]
5	Technical electives[2]
17	

Cr	Second Semester
3	Design elective[3]
2	Experimental Engineering—M E 460
9	Technical electives[2]
3	SSH elective[1]
17	

English Proficiency
The department requires a minimum of C– in both Engl 104 and 105 with at least a 2 00 average for the two courses

[1]Social sciences and humanities (SSH) elective courses must be chosen from a department-approved list and must include one of Econ 201 205 or 206 at least one 6-credit sequence at least 6 credits in the humanities and at least 6 credits in the social sciences No more than two 100 level courses are allowed

[2]Technical electives are to include at least 9 credits of mechanical engineering courses from 400- and 500-level offerings All technical electives must be chosen from a department approved list Suggested areas of specialization are the following

Energy conversion and utilization—M E 444 446 447 448 449 E E 456 457 I E 305

Machines and systems—M E 411 412 414 415 417 418 420 470 490F 511 515 516 518 549 E M 514 515 517 519 525 544 584

Materials and Manufacturing—M E 411 490G 515 520 521 526 529 E M 514 544 M S E 405 406 524

Thermal and environmental engineering—M E 441 442 444 445 446 447 475 490D 490J 490K 530 531 532 533 536 538 540 542 545 546 547 548 and applicable courses in other departments

Propulsion—M E 445 447 448 449 490J 490K 490L 542 548 Aer E 411

Nuclear Power—Nuc E 375 411 432 463

[3]The design elective must be chosen from M E 415 442 446 or 449

*Core professional curriculum A student must have a minimum grade-point average of 2 00 in this group of courses in order to graduate

Curriculum in Metallurgical Engineering

Administered by the Department of Materials Science and Engineering

Leading to the degree bachelor of science
Total credits required 129 5 See also *Basic Program*

Professional Program

Sophomore Year

Cr	Fall
2	Principles of Materials Science—M S E 201*
2	Introduction to Physical Metallurgy Laboratory—M S E 207*
5	Introduction to Classical Physics II—Phys 222
3	General Chemistry—Chem 178
1	Laboratory in General Chemistry—Chem 178L
4	Elementary Multivariable Calculus—Math 265
R	Seminar—M S E 210
17	

Cr	Spring
3	Processing and Fabrication of Materials—M S E 202*
3	Statics of Engineering—E M 274
3	Elementary Differential Equations —Math 266
4	SSH elective[1]
2	Metals Processing and Fabrication Laboratory—M S E 208*
R	Seminar—M S E 211
15	

Junior Year

Cr	Fall
3	Thermochemistry for Materials Science and Engineering—M S E 360*
4	Kinetics of Microstructure Development—M S E 305*
3	Instruments for Materials Characterization—M S E 315*
3	Mechanics of Materials—E M 324
4	Electronic Properties of Materials—M S E 343*
R	Seminar—M S E 310
17	

Cr	Spring
2	Applications of Statistics to Materials—M S E 341*
4	Physical Metallurgy—M S E 306*
3	Physical Metallurgy Laboratory—M S E 306L*
3	Mechanical Behavior of Materials—M S E 405*
3	Technical Communications—Engl 314
R	Seminar—M S E 311
15	

Senior Year

Cr	Fall
4	Mechanical Metallurgy—M S E 406*
3	Design for Thermal Processing—M S E 420*
3	SSH elective[1]
3	Technical elective[2]
4	Introduction to Circuits Instruments and Electronics—E E 441
R	Seminar—M S E 410
17	

Cr	Spring
3	Metallurgical Engineering *Design*—M S E 421*
6	SSH elective[1]
6	Technical electives[2]
R	Seminar—M S E 411
15	

English Proficiency

The Department of Materials Science and Engineering requires a grade of C or better in Engl 104 and 105 and in one additional 3-credit course in written communication from an approved list The current list is Engl 204 302 303 314 and 415 or their equivalents

[1]Social sciences and humanities (SSH) electives must be department approved

[2]Technical electives must be department approved

*Core professional curriculum A student must have a minimum grade-point average of 2 00 in this group of courses in order to graduate

College of Family and Consumer Sciences

Beverly J Crabtree Dean
Helen LeB Hilton Emeritus Dean
Ruth E Deacon Emeritus Dean
JaneAnn Stout Associate Dean—Families Extension
Donna L Cowan Associate Dean—Academic Programs
Rodney M Cate Associate Dean—Research and Graduate Education

Departments of the College

Family and Consumer Sciences Education and Studies
Food Science and Human Nutrition
Hotel Restaurant and Institution Management
Human Development and Family Studies
Textiles and Clothing

The mission of the College of Family and Consumer Sciences is to advance the well-being of families and consumers The family is the basic unit of societies throughout the world The family system is the setting for development of the human capital essential for social and economic growth and stability Productive and meaningful family life throughout the life cycle and in constantly changing environments is essential for development of this human capital

The family system is also the setting for consumer decision-making essential for sound management of resources Effectiveness of consumers in this management and decision-making process is essential to economic development of the state and nation Consumer satisfaction is enhanced when available goods and services meet basic needs for food clothing shelter nurturance emotional support and information

The college achieves its mission of advancing the well-being of families and consumers through an *integrative focus* on these needs and conditions that foster optimal human growth and development and create a market of products and services that enrich the lives of individuals The college creates applies and shares knowledge related to these needs and conditions The college develops and incorporates technological advances that enhance consumer products and services The college recognizes that these needs and conditions that support growth and development are often provided within the family system and also by business industry agencies and institutions that provide goods services and education to families The college also recognizes that advancing the well-being of families requires understanding of interactions within families biological and social bases for adequate development and interactions of families and consumers with external environments such as educational, economic social and political systems

Curricula in Family and Consumer Sciences

The College of Family and Consumer Sciences is fully accredited by the American Home Economics Association Council for Accreditation The curricula are planned to meet a variety of academic interests abilities and goals of the student Each curriculum requires depth in a discipline Breadth is acquired through general education and careful use of electives

Apparel Merchandising, Design, and Production
Child and Family Services —Options Child Services Family Services
Dietetics—Options General Dietetics Coordinated Undergraduate Program in Dietetics Dietetics and Specialized Studies (International Studies or Exercise Science)
Early Childhood Education—Prekindergarten through Third Grade Licensure
Family and Consumer Sciences Education—Options Educational Services in Family and Consumer Sciences Home Economics Education
Family Resource Management and Consumer Sciences—Options Family Resource Management and Consumer Sciences Family Financial Counseling
Food Science —Options Food Science and Technology Consumer Food Science Food Science and Industry
Hotel, Restaurant, and Institution Management—Options Hotel and Restaurant Management Foodservice Management
Housing and the Near Environment
Nutritional Science
Studies in Family and Consumer Sciences—Options General Studies in Family and Consumer Sciences International Studies in Home Economics
Teaching Prekindergarten-Kindergarten Children—Options Prekindergarten-Kindergarten Licensure Early Childhood Special Education Licensure

Minors

Minors are available to family and consumer sciences majors as well as to all ISU students A minor consists of at least 15 specified credits and is available in the following areas
Apparel Merchandising Design, and Production
Educational Services in Family and Consumer Sciences
Family Resource Management and Consumer Sciences
Child and Family Services
Food Science
Nutrition
Hotel Restaurant and Institution Management
Housing and the Near Environment

See *Index* for minor requirements for specific departments

Special Interest Programs

International and Cross Cultural Programs

Study abroad and student exchanges are available in the College of Family and Consumer Sciences The college has established programs with The Queen s College Glasgow Scotland University of Otago Dunedin New Zealand Hotel Consult Lake Geneva Switzerland Merida Yucatan and Central College at Pella Iowa in the Netherlands England Yucatan Austria France Wales and Spain Students also study at the London College of Fashion London England Other opportunities may be developed through consultation with the associate dean of academic programs and the student s adviser

Families Extension

Students may prepare for a career in the Cooperative Extension Service by enrolling in any curriculum in the College of Family and Consumer Sciences that provides them with a broad subject matter base for conducting educational programs for families Courses should include Psych 333 FCEdS 306 306L and Ad Ed 469 Advice on choice of additional courses should be sought from the associate dean and director to Families Extension programs the director to Youth and 4-H programs or the extension director to Human Resources

Honors Program

Superior students are encouraged to develop a creative program of study expanding their interests while meeting educational objectives Honors students participate in honors seminars and complete an honors project Students are expected to maintain a grade point average above 3 35 For further information contact the College Honors Committee academic adviser or see *Index Honors Program*

Approved Preprofessional Practice Program (AP4)

This postbaccalaureate program approved by the American Dietetic Association (ADA), is administered by the Department of Food Science and Human Nutrition The purpose of the program is to enable those who meet the academic requirements of ADA (Plan IV or V) to obtain at least 900 hours of practice supervised by registered dietitians in clinical and community nutrition and foodservice management Course work in the nondegree program will be evaluated on a satisfactory/fail basis Experiences over a 25-week (40 hours a week) period in a variety of health care and community settings meet ADA performance requirements for entry level dietitians Students who satisfactorily complete the AP4 will be eligible to take the examination administered by the Commission on Dietetic Registration (ADA)

Open Option Status

The College of Family and Consumer Sciences offers an open option for entering students who have not selected a specific area of study Family and Consumer Sciences Orientation 110 helps students explore the opportunities available Program planning information can be obtained from general college advisers

Secondary School Preparation

Preparation required for admission is 4 years English/language arts 3 years mathematics 3 years science 2 years social studies See page 7 for more complete information about the requirements

Advising System

Each student in the College of Family and Consumer Sciences has an academic adviser All freshmen are advised by general college advisers After the freshman year students are assigned faculty advisers in the departments of their chosen curricula Advisers assist students in making adjustments to the university and provide information and guidance on career choices Assistance is given the students in scheduling course work in accordance with their interests capabilities and career objectives

Planned Transfer Programs

The College of Family and Consumer Sciences has taken leadership in the development of program to program planned transfer plans with community colleges in Iowa and surrounding states In addition transfer plans are available with Central College and Morningside College in Iowa and personalized plans may be developed for a student attending another college By careful planning a student may take two years at the other college and two years at Iowa State to complete most curricula For more information call 1-800-522-0683 or contact the associate dean for academic programs College of Family and Consumer Sciences at Iowa State University

Preparation for Graduate Study

Students considering graduate studies should gain background knowledge in basic subjects related to their area of interest Undergraduate mathematics statistics and research methods courses are useful as preparation for advanced study in graduate school Upon completion of graduate programs students are qualified for leadership positions in public and private institutions and for teaching research, and extension positions in colleges and universities

Professional Opportunities in Home Economics

Placement of graduates remains at a high level The flexibility of the program allows for a wide range of job interests related to the well-being of individuals and families Graduates find employment in diverse areas such as industry business education, research organizations government and community agencies Examples of business opportunities include hotel and restaurant management day care housing and furnishings consultant financial counselor apparel merchandising or design test laboratory home economist for foods or textiles sales representative consumer product specialist and educational services coordinator Often the graduate s strength is in interpreting the products or services of the organization to families and consumers and in representing the interests of families and consumers within the organization Graduates also teach preschool and kindergarten children and/or preschool children with handicaps or teach home economics in public schools and through the extension service Health social service recreation organizations and government agencies employ dietitians and other specialists for child family and consumer services Some students plan programs to prepare for professional programs such as medicine law and hospital and health administration while pursuing a B S degree

The Career Planning and Placement Office delivers a broad range of services to help students prepare for the job search process Students learn to identify their career goals write resumes and letters network with professionals, and develop interviewing skills Services to facilitate employer contacts include the senior/alumni resume file the 'Positions Available List publication, on-campus recruiting and an annual College Career Day The Placement Office maintains a resource center of career related materials and employer information Alumni placement services are made available to graduates

General Education

Each department within the college requires students to select and/or elect courses to fulfill a specific number of credits in prescribed areas

Minimum Group Requirements in the College of Family and Consumer Sciences

Cr	
9 5	I Communications and Library
9	II Natural sciences and mathematical disciplines
9	III Social sciences
9	IV Humanities
8	V Family and Consumer Sciences*

Independent Study

Students may pursue independent work by enrolling in 490 courses in individual departments No more than a total of nine semester credits of independent study may be applied to a degree in family and consumer sciences

*Assumes additional credits will be necessary for meeting the objectives of the College of Family and Consumer Sciences including the areas of management aesthetics educational principles public policy and requirements in specific degrees

Curriculum in Apparel Merchandising, Design, and Production

Administered by the Department of Textiles and Clothing Leading to the degree bachelor of science Total credits required 128 5

The major in apparel merchandising design and production provides a broad based program of study with flexibility in creating a program focus Courses are required in the following groups general education family and consumer sciences core and textiles and clothing core To complete the program a student combines structured clusters of courses to form a program focus

A minor in apparel merchandising design and production is available, the requirements appear under *Textiles and Clothing Courses and Programs*

Cr	Degree Requirements
12 5	**Communications and library**
6 5	Engl 104 105 Lib 160
3	Select from Engl 302 309 314
3	HD FS 370 or Sp Cm 212
14-18	**Natural sciences and mathematical disciplines**
3-5	Select from Chem 160 or 163 and 163L Phys 101, 106 111
3-4	Select from Math 104 140 141 150 151 165

4	Com S 103
4-5	Stat 101 or 227
9	**Social sciences**
6	Econ 205 206
3	Select from anthropology psychology sociology
9	**Humanities** Select from family and consumer sciences approved list (except T C courses) Must include one history course foreign language recommended
8	**Family and consumer sciences core** FCEdS 110 or 210 260 310 460 FS HN 167 HD FS 102
	Professional courses
37-39	**Textiles and clothing core**
26	T C 131 165 204 231 245 275 375 380 410
3	Art 101 or 108
3	Human studies Select from T C 354 466 475
3-4	Product development Select from T C 225 305 404
2-3	International T C 362 or 462

Primary focus areas
Select one cluster from primary focus areas

12-13	**Merchandising**
6	T C 376 Acct 284
6-7	Select from T C 278 377 462 470 475 Jl MC 330 Mkt 410
17-19	**Design**
13	T C 121 225 278 Art 130
4-6	Select from T C 325 345 354 423 424 468 470
12	**Production/Apparel Engineering**
12	T C 331 470 I E 277 375

Secondary focus areas
Select a second cluster from the remaining primary focus areas or from the secondary focus areas

9	**Consumer behavior/marketing**
3	Mkt 340
6	Select from T C 466 470 499 Econ 301 355 411 HD FS 215 Hist 376 Jl MC 330 Mkt 341 442 410 444 447 Psych 250
8-9	**History**
6	T C 354 355
2-3	Select from T C 362 470 499 art history
9	**Human relations/ communications/ management**
3	T C 475
6	Select from T C 466 470 499 ComSt 310 314 317 318 HD FS 370 Mgmt 370 Psych 450 451 Sp Cm 212 Soc 380
9	**Product development**
9	Select from T C 121 221 225 305 331 345 404 466 468 470 499
9	**Quality assurance**
6	T C 305 331
3	Select from T C 404 470 499 I E 361 373 476
	Electives Select courses to broaden or complement the focus (see adviser)
128 5	**Total credits**

Curriculum in Child and Family Services

Administered by the Department of Human Development and Family Studies Leading to the degree bachelor of science Total credits required 128 5

The child and family services curriculum prepares students for professional work with children and families in a variety of public and private human service agencies and organizations Examples include schools child care programs services to the elderly community action and crisis intervention A minor in child and family services is available the requirements appear under *Human Development and Family Studies Courses and Programs* An adolescent focus is available see the department for details

Cr	Degree Requirements
15 5-16 5	**Communications and library**
9 5	Engl 104 105 Lib 160 Sp Cm 212
3	Select from Engl 204 309
3-4	Select from Com S 103 SecEd 101
10	**Natural sciences and mathematical disciplines**
4	Stat 101
3	Select from Zool 155* 258
3	Select from math natural sciences statistics
9	**Social sciences** Select from American government anthropology economics political science psychology sociology
9	**Humanities** History or literature offered by history or English departments appreciation or history of art music or theatre ART 101 Dance 270 360 Dsn S 121 327 foreign languages philosophy religious studies LAS 230 Tc A 237 238, T C 342 Thtre 106 465 466 W S 201
5	**Family and consumer sciences core** FCEdS 110 or 210 260 310 FS HN 167
21	**HD FS core** HD FS 102 218 269 391 449 491
18	**Related Disciplines** Select from anthropology business economics education gerontology health studies human development and family studies family resource management housing and the near environment child services or family services political science psychology social work sociology speech
	Select one emphasis
22-24	**Child services option**
9	Select from HD FS 224 225 226 255 Psych 430 or Soc 473
8-9	Select from HD FS 343 349 317D or 340
5-6	Select from HD FS 276 310 367 443 445
27	**Family services option** Select from HD FS 276 349 360 367 370 373 378 380 479
13-19	**Electives**
128 5	**Total**

*Biology 109 recommended before Zoology 155 for students without high school biology

Curriculum in Dietetics

Administered by the Department of Food Science and Human Nutrition and available to students in both the College of Agriculture and the College of Family and Consumer Sciences

Option 1 General Dietetics

The student is prepared for admission to dietetic internship programs and other professional experience programs approved/accredited by The American Dietetic Association Courses included have been approved as meeting the academic requirements of The American Dietetic Association There is a $25 fee for a statement of verification of completion of the approved program

Cr	Degree Requirements
12 5	**Communications** Engl 104 105 FCEdS 310 ** Lib 160 Sp Cm 212 Select from Jl MC 205 or 3 credits of written English communications intensive requirement*
6-7	**Mathematical sciences** 3 credits in college level math Stat 101 or 104 demonstration of computer literacy
9	**Physical sciences** Chem 163 163L 231 232
20 21	**Biological sciences** B B 301 311 Biol 201 201L MIPM 202 Zool 155 156 select from Gen 260 or Biol 202 or 202 202L
13	**Social sciences*** Econ 201 HD FS 102 or Psych 230 ** Psych 101 Soc 134
9	**Humanities** 3 cr focusing on multicultural or international issues and 3 cr of ethics and 3 cr in critical thinking are required
33	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 ** FS HN 167 ** 203 ** 214 260 360 360L 403 411 461 463 466 480 ** problem-solving component * environmental-intensive component*
11	**Management** HRI 380 380L 391 392
13-15	**Electives**
128 5	**Total credits**

*See department for procedures to meet requirements Critical thinking requirement met by Psych 101

**These courses fulfill the requirement for CFCS core

***A student who has not had high school civics is required to take Pol S 215

Option 2 Coordinated Undergraduate Program

The coordinated undergraduate program integrates academic study with clinical experience so that graduates are eligible to take the national registration examination in dietetics upon completion of the baccalaureate degree The program is accredited by The American Dietetic Association Planning for this option should begin in the freshman year Application for admission is usually made during the sophomore year and applicants must have a cumulative grade point average of 2 5 Enrollment is limited by the availability of clinical facilities There is a program fee of $15 for the junior year and $25 for the senior year

Cr	Degree Requirements
9 5	**Communications** Engl 104 105 FCEdS 310 ** Lib 160 Sp Cm 212 communications intensive *requirement**
6-7	**Mathematical sciences** 3 credits in college-level math Stat 101 or 104 demonstration of computer literacy
9	***Physical sciences*** Chem 163 163L 231 232
17	**Biological sciences** B B 301, 311 Biol 201 201L MIPM 202 Zool 155 156
13	**Social sciences***** Econ 201 HD FS 102 or Psych 230 ** Psych 101 Soc 134
9	**Humanities** 3 cr focusing on multicultural or international issues 3 cr in ethics and 3 cr in critical thinking are required
51	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 ** FS HN 167 ** 203 ** 214 260 340 360 360L 411 440 441 442 443 445 461 463 466 480 ** problem-solving component * environmental-intensive component*
13	**Management** HRI 380 380L 391 392 436
0-1	**Elective**
128 5-131 5	**Total credits**

*See department for procedures to meet *requirements Critical thinking requirement* met by Psych 101

**These courses fulfill requirement for CFCS core

***Students who have not had high school civics are required to take Pol S 215

Option 3 Dietetics and Specialized Studies

This option is for students who are interested in combining the study of dietetics with that of exercise science or international studies Courses listed immediately below include those that meet the academic requirements of The American Dietetic Association Additional courses for the areas of specialization are as approved by the Department of Physical Education and Leisure Studies and the Family and Consumer Sciences International Studies Committee respectively Total credits required for graduation will depend upon which of the specialized areas of study is selected The student is prepared for admission to dietetic internship programs and other professional experience programs approved/accredited by The American Dietetic Association There is a $25 fee for a statement of verification of completion of the approved program

Option 3 is available only as a double degree in dietetics and exercise science or a double major with international studies in home economics

Cr	Degree Requirements
12 5	**Communications** Engl 104 105 FCEdS 310 ** Lib 160 Sp Cm 212 communications intensive *requirement**
6-7	**Mathematical sciences** 3 credits in college-level math Stat 101 or 104 demonstration of computer literacy
9	***Physical sciences*** Chem 163 163L 231 232
12	**Biological sciences** B B 301 Biol 201 MIPM 202 Zool 155
13	**Social sciences***** Econ 201 HD FS 102 or Psych 230 ** Psych 101 Soc 134
9	**Humanities** 3 cr in ethics and 3 cr in critical thinking are required For exercise science double degree 3 cr focusing on multicultural or international issues are required for international studies double major a minimum of two years university proficiency in one foreign language is required
28	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 ** FS HN 203 ** 214 260 360 360L 411 461 463 466 480 ** problem-solving component * environmental-intensive component*
11	**Management** HRI 380 380L 391 392
30-31	**Electives** 30-31 cr from courses required from physical education or international studies in home economics can be used as *elective credits in the dietetics* degree requirements
128 5	**Total credits**

44-45	Additional credits for double major in international studies in *home economics* (option under Curriculum in General Studies in Family and Consumer Sciences)
74-75	*Additional credits for double* degree in exercise science (option under Curriculum in Physical Education)

*See department for procedures to meet requirements Critical thinking requirement met by Psych 101

**These courses fulfill requirement for CFCS core

***Students who have not had high school civics are required to take Pol S 215

Curriculum in Early Childhood Education

The curriculum in early childhood education is planned for students preparing to teach pre-kindergarten through third grade The curriculum is administered jointly by the Department of Curriculum and Instruction College of Education and the Department of Human Development and Family Studies College of Family and Consumer Sciences A double major with teaching prekindergarten-kindergarten children with the early childhood special education option is available See Department of Human Development and Family Studies for information

Total credits required 136 5

Cr	
41 5	**General education**
12 5	Communication skills Engl 104 (3) 105 (3) Lib 160 (5) Sp Cm 212 (3) Options (3)
9	Natural sciences and mathematics Biological sciences (3) mathematics (3) natural science (3)
9	Social sciences American history or American government (3) options (6)
9	Humanities Options (9)
2	Health dance physical education safety H S 105 (2)
18	**Human development and family studies** FS HN 167 (3) HD FS 102 (3) or Psych 230 (3) HD FS 224 (3) 225 (3) 226 (3) select 3 credits from HD FS 255 or Sp Ed 250
71	**Professional education**
9	Professional education core El Ed 204 (3) 301 (1) 406 (2) Psych 333 (3) Orientation (R)
17	Prekindergarten-Kindergarten Education HD FS 310 (2) 340 (3), 343 (3), 445 (3) 449 (3) select 3 credits HD FS 443 or El Ed 447
21	Elementary Education El Ed 245 (2) 268 (1) 375 (3) 468A (1) 376 (3) 468B (1) 448 (3) 468C (5) 449 (3) 468D (5) 443 (3)

8	Related courses HDFS 240 (3) SecEd 101 (3) select 2 credits Art 211 (2) HD FS 353 (3), H S 275 (3) Music 265 (3) 364 (3), P E 284 (3) Thtre 359 (3) 362 (3) U St 225 (3) El Ed 450 (3)
16	**Student Teaching** El Ed 417 A (8) HD FS 417B (8)
6	**Electives**

Curriculum in Family and Consumer Sciences Education

Administered by the Department of Family and Consumer Sciences Education and Studies Leading to the degree bachelor of science Total credits required 128 5

This curriculum offers two options Option 1 educational services in family and consumer sciences and Option 2 home economics education

Option 1 is designed for students seeking careers as home economists in a variety of settings Specifically the curriculum prepares students to apply educational principles to career opportunities in extension business community agencies community colleges and public school adult education programs

Option 2 is designed for students interested in becoming licensed to teach in general home economics vocational family and consumer education and in diversified occupational home economics programs in middle junior and senior high schools With additional credits students may also be approved to teach in specific occupational areas child care fashion merchandising and foodservice Restricted approval to teach health education may be obtained by taking additional credits listed below Further information about licensure program appears under *College of Education*

The department offers a minor in educational services in family and consumer sciences the requirements appear under *Family and Consumer Sciences Education and Studies Courses and Programs*

Cr	Degree Requirements
9 5	**Communications and library**
6	Engl 104 105
3	Sp Cm 212
0 5	Lib 160
11	**Natural sciences and mathematical disciplines**
5	Chem 163 163L
3	Select a mathematics course*
3-4	Zool 155 or Biol 109
10-12	**Social sciences**
4-6	Econ 201 or 205 and 206
3	Soc 134
3	Psych 230
9	**Humanities****
3	Select from American history or American government***
6-9	Additional courses from family and consumer sciences approved list
8	**Family and consumer sciences core** FCEdS 110 or 210 260, 310 460 FS HN 167 HD FS 102
21-24	**Additional family and consumer sciences**
3-5	FS HN 211 or 214
3	Select from HD FS 224, 225 226
3	HD FS 239 or 446
3	HD FS 283 or 483
3	HD FS 378
3-4	T C 104 or 204
3	T C 121
12	**Professional core** FCEdS 206 206L 279 306 306L Psych 333 Sec Ed 301

Option 1 Educational Services in Family and Consumer Sciences

12	**Additional family and consumer sciences**
3	HD FS 370
3	T C 342
6	Select 6 credits 300 or above in FS HN HRI HD FS or T C
23-25	**Additional professional courses** Ad Ed 469 or FCEdS 421 Engl 309 314 or Sp Cm 312 FCEdS 314 415 418 HRI 287 or Mgmt 370 or Mkt 340 JI MC 205

Option 2 Home Economics Education

9	**Additional family and consumer sciences** HD FS 210 or T C 342 HD FS 215 or 488 349
28-32	**Additional professional courses** FCEdS 318 403 413 417A 417B 420 Psych 430 SecEd 204 406 415 426
3	**Dance, health, physical education**
3	H S 215
0-13	**Electives**
128 5	**Total credits**

Additional secondary teaching options available

Child care HD FS 225 343 443 445
Fashion merchandising T C 275 375 376 Acct 284 Com S 103
Foodservice Biol 109 Micro 300 305 HRI 380 380L 434 438
Health education HD FS 276 H S 110 305 310 350 375 390 Zool 156

*Option in home economics education must select a math course

**List of approved courses may be obtained in departmental office

***Required for option in home economics education

Curriculum in Family Resource Management and Consumer Sciences

Administered by the Department of Human Development and Family Studies Leading to the degree bachelor of science Total credits required 128 5

This curriculum focuses on the behavior of families as they allocate and manage their resources and function as consumers A minor in family resource management and consumer science is available the requirements appear under *Human Development and Family Studies Courses and Programs*

Cr	Degree Requirements
12 5	**Communications and library** Engl 104 105 204 or 302 Sp Cm 212, Lib 160
10-11	**Natural sciences and mathematical disciplines** Biol 109 or Zool 155 Com S 103 or 107 Stat 101
15	**Social sciences** Econ 205 206 Pol S 215 Psych 101 or 250 Soc 134
9	**Humanities** Select from history or literature offered by history or English departments appreciation or history of art music or theatre Art 101 Dance 270 360 Dsn S 121 327 foreign languages philosophy religious studies LAS 230 Tc A 237 238 T C 342 Thtre 106 465 466 W S 201
5	**Family and consumer sciences core** FCEdS 110 or 210 260 310 460 FS HN 167
21	**HD FS core** HD FS 102 218 269 391 449 491

Option 1 Family Resource Management and Consumer Sciences

Cr	Degree Requirements
18	HD FS 215 283 378 483 488 3 credits in Econ**
3	Select from HD FS 380 Acct 215
6	Select from HD FS 239, 341 360 370 377 448, 489
12	Select from accounting economics finance history journalism management marketing political science psychology sociology
16-17	**Electives**
128 5	**Total credits**

**Select from departmentally approved list

Option 2 Family Financial Counseling

Cr	Degree Requirements
34-35	HD FS 215 283 341 378 483 488 489 489L Acct 284 Econ 301 and 302 or 304, HD FS 380 or Acct 215
3	Select from HD FS 370 448 Soc 305 Psych 280
17-19	Electives
128 5	Total credits

Curriculum in Food Science

Administered by the Department of Food Science and Human Nutrition and available to students in both the College of Agriculture and the College of Family and Consumer Sciences

Option 1 Food Science and Technology

Cr	Degree Requirements
9 5	**Communications** Engl 104 105 and 302 or 314 FCEdS 310** Lib 160 Sp Cm 212 or ComSt 101 or 102 communications intensive requirement*
14-16	**Mathematical sciences** Com S 103 or equivalent Math 165 166 Stat 101 or 104
23-28	**Physical sciences** Chem 163 163L 164 164L and 211 or 177 177L and 178 Chem 331 332 333A
12	**Biological sciences** B B 301 Biol 201 201L MIPM 202 202L,
9	**Social sciences** HD FS 102 or Psych 230 ** 6 additional credits
9	**Humanities** 3 cr focusing on multicultural or international issues 3 cr in ethics and 3 cr in critical thinking are required *
40	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 ** FS HN 203 ** FS HN 311 360 ** 403 410 420 421 451 452 471 472 480** Select additional courses in FS HN at 200 level or above to total 40 credits problem-solving component,* environmental-intensive component *
5-12	**Electives**
128 5	**Total credits**

*See department for procedures to meet requirements Critical thinking requirement met by Psych 230

**These courses fulfill the requirements for CFCS core

Option 2 Food Science and Industry

Cr	Degree Requirements
15 5	**Communications** Engl 104 105 FCEdS 310 ** Lib 160 Sp Cm 212 6 cr from an approved list, communications-intensive requirement*
9-11	**Mathematical sciences** Com S 103 or equivalent, 3 cr college-level math Stat 101 or 104
13	**Physical sciences** Chem 163 163L 231 232 Phys 106
12	**Biological sciences** Biol 201 201L MIPM 202 202L B B 301
9	**Social sciences** HDFS 102 or Psych 230 ** Econ 205 206
9	**Humanities** 3 cr focusing on multicultural or international issues, 3 cr in ethics and 3 cr in critical thinking are required *
8-10	**Business** Select one course from each group Econ 304 or any Acct Econ 404 I E 375 Mgmt 235, 370 371 Soc 264 380 420 Econ 301 335 338 Mkt 340 341 410 442 444 447
40	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210,** FS HN 202 203 311 360 372 403 405 410 420 421 471 480 Select additional courses in FS HN at 200 level or above to total 40 credits problem-solving component * environmental-intensive component *
9-13	**Electives**
128 5	**Total credits**

*See department for procedures to meet requirements Critical thinking requirement met by Econ 205

**These courses fulfill the requirements for the CFCS core

Option 3 Consumer Food Science

Cr	Degree Requirements
21 5	**Communications** Engl 104 105 and 302 or 314 FCEdS 310 ** Jl MC 205 330 Lib 160 Sp Cm 212 312 communications intensive requirement*
9-11	**Mathematical sciences** Com S 103 or equivalent 3 cr college-level math Stat 101 or 104
9	**Physical sciences** Chem 163 163L 231 232
15	**Biological sciences** Biol 201 201L B B 301 MIPM 202 202L Zool 155
13	**Social sciences** Econ 201 HD FS 102 or Psych 230 ** Mkt 340 447
9	**Humanities** 3 cr focusing on multicultural or international issues 3 cr in ethics and 3 cr in critical thinking are required *
40	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 ** FS HN 203 ** 214 260 or 461 or 463 304 311 or B B 311 FS HN 360 ** 411 412 471 480** Choose from the following to total 40 credits 403 405 416 419 420 421 HRI 380 and 380L problem solving component * environmental-intensive component*
10-12	**Electives**
128 5	**Total credits**

*See department for procedures to meet requirements Critical thinking requirement met by Psych 230

**These courses fulfill the requirements for the CFCS core

Curriculum in Hotel, Restaurant, and Institution Management

Administered by the Department of Hotel Restaurant and Institution Management Leading to the degree bachelor of science Total credits required 128 5

Option 1 Hotel and Restaurant Management

The option in hotel and restaurant management prepares men and women for a variety of managerial positions in hotels motels restaurants clubs residence halls and other types of establishments providing lodging and foodservice

Cr	*Degree Requirements*
12 5	**Communications and library** Engl 104 105 302 Lib 160 Sp Cm 212
17	**Natural sciences and mathematical disciplines** Biol 109 Chem 163 163L Math 104 140 or 150 MIPM 130 Stat 101
12	**Social sciences** Econ 205 206 Psych 101 Soc 134
11	**Humanities** A list of courses may be obtained from the departmental office Must include 2-3 credits of art or T C 342
5	**Family and consumer sciences** FCEdS 110 or 210 260 310 460 HD FS 102
19-20	**Hotel restaurant, and institution management core** HRI 287 288 380 380L 393 or 491 433 434 438

Cr	
14	**Hotel and restaurant management professional courses** HRI 440 460 select from HRI 289 350 390 435 436 437 439 450, 455 483 485 485L
21	**Other professional courses** Acct 215 284 An S 371 Com S 103 FS HN 167 211 Mkt 340
16-17	**Electives**
128 5	**Total credits**

Option 2 Foodservice Management

The option in foodservice management prepares men and women for a variety of positions in the noncommercial institutional foodservice sector as foodservice managers and foodservice directors

Cr	Degree Requirements
12 5	**Communications and library** Engl 104 105 302 Lib 160 Sp Cm 212
17	**Natural sciences and mathematical disciplines** Biol 109 Chem 163 163L Math 104 140 or 150 MIPM 130 Stat 101
12	**Social sciences** Econ 205 206 Psych 101 Soc 134
11	**Humanities** A list of courses may be obtained from the departmental office Must include 2-3 credits of art or T C 342
5	**Family and consumer sciences** FCEdS 110 or 210 260 310 460 HD FS 102
19-20	**Hotel, restaurant, and institution management core** HRI 287 288 380 380L 393 or 491 433 434 438
14	**Foodservice management professional courses** HRI 435 485 485L select from HRI 289 350 390 436 437 439 440 450 455 460 483
21	**Other professional courses** Acct 215 284 An S 371 Com S 103 FS HN 167 211 Mkt 340
16-17	**Electives**
128 5	**Total credits**

Curriculum in Housing and the Near Environment

Administered by the Department of Human Development and Family Studies Leading to the degree bachelor of science Total credits required 128 5

The curriculum in housing and the near environment focuses on housing needs issues and trends such as housing alternatives for families and children housing for the elderly and persons with disabilities, residential property management and public policy Graduates of this curriculum are prepared for employment in the housing industry including housing-service organizations public and private (profit and not-for-profit) agencies real estate and lending institutions housing management and administration housing equipment/furnishings industries and housing advocacy A minor in housing and the near environment is available the requirements appear under *Human Development and Family Studies Courses and Programs*

Cr	Degree Requirements
9 5	**Communications and library** Engl 104 105 Sp Cm 212 Lib 160
9	**Natural sciences and mathematical disciplines**
3	Select from Biol 109, 201 Zool 155
6	Select from natural science mathematics statistics
9	**Social science** Select from anthropology economics geography political science psychology sociology
9	**Humanities** Select from history or literature offered by history or English departments appreciation or history of art music or theatre Art 101 Dance 270 360 Dsn S 121 237 foreign languages philosophy religious studies LAS 230 Tc A 237 238 T C 342 Thtre 106, 465 466 W S 201
5	**Family and consumer sciences core** FCEdS110 or 210 260 310 460 FS HN 167
21	**HD FS core** HD FS 102 218 269 391 449 491
24	**Housing** HD FS 210 239 254 341 360 446 462 463
30	**Related professional courses** Select from (a) public policy (b) designing for people with disabilities (c) housing management and/or (d) housing alternatives course lists *
12	**Electives**
128 5	**Total credits**

*See department for course lists

Curriculum in Nutritional Science

Administered by the Department of Food Science and Human Nutrition and available to students in both the College of Agriculture and the College of Family and Consumer Sciences

Cr	Degree Requirements
12 5	**Communications** Engl 104, 105 314 FCEdS 310 ** Lib 160 Sp Cm 212 communications intensive requirement*
9-11	**Mathematical sciences** 3 credits in math (college-level) Com S 103 or equivalent Stat 101 or 104
28-29	**Physical sciences** Chem 163 163L 164 164L or 177 177L, 178 211 331, 332 333A 334A, Phys 111 112
21-23	**Biological sciences** B B 404 and 405 or 420 Biol 201 201L 202 202L MIPM 202 202L Zool 355
18	**Humanities and social sciences** HD FS 102 or Psych 230 ** 6 cr or more social sciences 6 cr or more humanities 2 semesters in a foreign language recommended 3 cr focusing on multicultural or international issues 3 cr in ethics and 3 cr in critical thinking are required *
22-24	**Food science and human nutrition** FS HN 110 or FCEdS 110 or 210 ** FS HN 203 ** 214 360 360L 480 ** select 10-12 credits from FS HN 403 419 461 463 490C (max 3 cr) 490 (max 3 cr) 560 565 575 problem-solving component * environmental-intensive component*
2-5	**Management** Select from HRI 287 or 380 and 380L
6-16	**Electives**
128 5	**Total credits**

*See department for procedures to meet requirements Critical thinking requirement met by Psych 230

**These courses fulfill the requirement for CFCS core

Curriculum in Studies in Family and Consumer Sciences

Administered by the Department of Family and Consumer Sciences Education and Studies Leading to the degree bachelor of science Total credits required 128 5

This is a flexible curriculum designed to provide students with courses in home economics and international studies Students pursue individualized programs which have been planned with their academic advisers This allows students latitude to choose between two options Option 1 General Studies in Family and Consumer Sciences and Option 2 International Studies in Home Economics Career opportunities for students with backgrounds in family and consumer sciences and international studies include a variety of settings Alternatively, students may choose a preprofessional emphasis

Cr	Degree Requirements
9 5	Communications and library
6	Engl 104 105
3	Sp Cm 212 or HD FS 370
0 5	Lib 160
9	Natural sciences and mathematical disciplines
3	Select from Biol 109 201 Zool 155
3	Select a mathematics course
3	Additional natural science or math
10-12	Social sciences
4-6	Econ 201 or 205 and 206
3	Soc 130 or 134
3	Anthr 201
9	Humanities Select from family and consumer sciences approved list Foreign language*
8	Family and consumer sciences core FCEdS 110 or 210 260 310 460 FS HN 167 HD FS 102
36	Additional family and consumer sciences
3	FCEdS 421
3	HD FS 283 or 378
3	T C 342
27	Family and consumer sciences content area (specific emphasis or general emphasis)

Option 1 General Studies in Family and Consumer Sciences

14	Select from natural sciences social sciences humanities art and design
4	Select from Com S 103 107 207 C I 101 FCEdS 314
3	Select from Engl 302 314 Jl MC 205 Sp Cm 312

Option 2 International Studies in Home Economics**

3	History of area or region***
6	Geology anthropology or political science of area or region
3	Anthr 311 or Soc 411
3	Anthr 313
3	Geog 100 or 324
6	IntSt 235 430
3	T SC 341
2-3	Select from FS HN 565 HD FS 575 T C 362
15-26	Electives
128 5	Total credits

*Required for option in international studies in home economics student must demonstrate the equivalence of two years of university-level study in one language in addition to English A student whose language is other than English must pass Engl 105 with a grade of C or better

**An international experience is encouraged when possible and should be discussed with adviser

***A specific geographic area emphasis is to be selected

Curriculum in Teaching Prekindergarten-Kindergarten Children

Administered by the Department of Human Development and Family Studies Leading to the degree bachelor of science Total credits required 128 5

The student selecting the curriculum in teaching prekindergarten-kindergarten children may choose one of two options Option 1 prekindergarten-kindergarten licensure leads to careers in teaching in prekindergarten and kindergarten programs and in programs such as child care and preschool This option has been approved by the Iowa Department of Education for teacher licensure with an endorsement in teaching prekindergarten-kindergarten children A double major with elementary education is available contact the Department of Human Development and Family Studies for additional information Option 2 teaching in early childhood special education leads to careers in teaching children birth through five with special needs and who are in home based programs or in center based programs involving the child and family This option has been approved by the Iowa Department of Education for teacher licensure and includes endorsements in early childhood special education and in teaching prekindergarten-kindergarten children A minor in child and family services is available the requirements appear under *Human Development and Family Studies Courses and Programs*

Option 1 Prekindergarten-Kindergarten Licensure

Cr	Degree Requirements
12 5-13 5	Communications and library Engl 104 105 Sp Cm 212 Lib 160 Com S 103 or SecEd 101
9-10	Natural sciences and mathematical disciplines
3	Zool 155 or 258
3 4	Select from Math 105 150 195
3	Select from natural sciences statistics
9	Social sciences
3	Select from American history American government
6	Select from anthropology economics political science psychology sociology
9	Humanities History or literature offered by history or English departments appreciation or history of art music or theatre Art 101 Dance 270 360 Dsn S 121 foreign languages philosophy religious studies LAS 230 Tc A 237 238 Thtre 106 465 466 W S 201
5	Family and consumer sciences core FCEdS 110 or 210 260 310 405 FS HN 167
21	HD FS core HD FS 102 218 269 391 417A 449
50-51	Professional courses
42	HD FS 225 240 255 310 343 417B 443 445 El Ed 204 301 406 H S 105 Psych 333
5-6	HD FS 224 and 340 or 226 and 317D
3	Select from El Ed 447 Music 265 364 P E 284 Thtre 362
13-16	Electives
128 5	Total credits

Option 2 Early Childhood Special Education Certification

Cr	Degree Requirements
12 5-13 5	Communications and library Engl 104 105 Sp Cm 212 Lib 160 Com S 103 or SecEd 101
9 10	Natural sciences and mathematical disciplines
3	Zool 155 or 258
3-4	Select from Math 105 150 195
3	Select from natural sciences statistics
9	Social sciences
3	Select from American history American government
6	Select from anthropology economics political science psychology sociology
9	Humanities Select from history or literature offered by history or English departments appreciation or history of art music or theatre Art 101 Dance 270 360 Dsn S 121 foreign languages philosophy religious studies LAS 230 Tc A 237 238 T C 342 Thtre 106 465 466 W S 201
5	Family and consumer sciences core FCEdS 110 or 210 260 310 405 FS HN 167
21	HD FS core HD FS 102 218 269 391 417A 449
58	Professional courses
55	HD FS 224 225 255 310 310L 340 343 353 417C 443 455 456 El Ed 204 301 406 H S 105 Psych 333 CmDis 275
3	Select from HD FS 240 CmDis 286 480 El Ed 447
3 5	Electives
128 5	Total credits

College of Liberal Arts and Sciences

David Glenn-Lewin Interim Dean
Zora D Zimmerman Associate Dean
Kim Smith Interim Associate Dean
J D Beatty Assistant Dean
Ruth W Swenson Emerita Associate Dean

Departments of the College

Air Force Aerospace Studies
Anthropology
Biochemistry and Biophysics
Botany
Chemistry
Computer Science
Economics
English
Foreign Languages and Literatures
Geological and Atmospheric Sciences
History
Journalism and Mass Communication
Library
Mathematics
Military Science
Music
Naval Science
Philosophy
Physics and Astronomy
Political Science
Psychology
Sociology
Speech Communication
Statistics
Zoology and Genetics

In the College of Liberal Arts and Sciences, students select from a wide and rich range of program options The goal of the college is to prepare the student to enter the world beyond the university with skills in reasoning analysis and communication with an appreciation of history and culture an understanding of the challenges of the future and a sensitivity toward people and their environments To achieve this goal the college asks students to acquire depth in learning within disciplines of their own choice by way of single or multiple majors Meaningful breadth in learning is acquired through elective courses and courses fulfilling general education requirements

The College of Liberal Arts and Sciences is the academic home the foundation, for many essential learning disciplines The college provides students with all the components of a modern liberal arts education Students may choose to study in various fields of the physical biological and social sciences in mathematical disciplines in methods and systems of communication and in the arts and humanities

The flexible degree requirements in the curriculum in Liberal Arts and Sciences permit programs of study suited to a variety of interests and goals Students having academic interests not fully met by a traditional major may apply for a major in interdisciplinary studies The college participates in the University Honors Program thus students of exceptional academic promise can develop unique and challenging programs of study

The college has three curricula a curriculum in Liberal Arts and Sciences, leading to the bachelor of arts or the bachelor of science degree a curriculum in music leading to the bachelor of music degree and a curriculum in the liberal arts leading to the bachelor of liberal studies degree

High School Preparation/ Admission Requirements

Students entering the college are required to present evidence of the following high school preparation

4 years of English (Typically this preparation will include courses in British American and world literature in which critical reading and writing skills are emphasized and courses in speech and composition including at least one senior-level writing course)

3 years of social studies (Typically such preparation will include two semesters of world history two semesters of American history and a semester of American government Electives can be chosen from areas such as economics sociology or psychology)

2 years of a single foreign language (Three years or more of a single foreign language are strongly recommended for students who wish to continue their work in that language Three years of a single foreign language will also exempt students from the foreign language graduation requirement in the College of Liberal Arts and Sciences)

3 years of mathematics (Such preparation shall include two semesters of beginning algebra two semesters of geometry and two semesters of intermediate algebra A fourth year of study involving analytic geometry trigonometry linear algebra and/or calculus is strongly recommended for students who will major in mathematical or scientific disciplines)

3 years of science (At least two years of such preparation shall be chosen from biology chemistry and physics)

Recommended but not required as a condition of admission to the College of Liberal Arts and Sciences is one semester of computer science (Such a course should stress problem-solving with computers and should not substitute for courses in mathematics In schools where computer use is an integral part of most courses separate instruction in computers is not necessary)

Students who transfer from another college or university with at least 24 credits of satisfactory coursework may be exempt from most of these requirements Students who do not meet the requirements listed here may be admitted with a limited number of deficiencies provided that they can be removed by the end of the first academic year For further information about remedying deficiencies contact the college office

Transfer Students

To graduate from the College of Liberal Arts and Sciences a transfer student must complete the general requirements of the college as well as those of the university Students planning to transfer to Iowa State University for the purpose of enrolling in the College of Liberal Arts and Sciences are advised to contact the College Office 204 Carver Hall for information concerning degree program requirements Prospective transfer students are urged to learn about the academic programs that are of interest to them well before arriving on campus in order to prepare for admission by taking courses that are appropriate to the planned major and transferable toward graduation from ISU Additional information concerning transfer credit evaluation may be obtained through the Admissions Office as well as the department in which a student is interested

A transfer student in the College of Liberal Arts and Sciences may choose to graduate under the catalog in effect at the time of his or her graduation or under one of the two immediately preceding catalogs provided that it covers the period of his or her enrollment either at Iowa State or any other accredited school Full requirements of the chosen catalog must be met except that adjustments will be made in instances where courses are no longer available or where programs have been changed A transfer student is responsible for reviewing his/her transfer credit evaluation with the academic adviser during the first semester of enrollment

University Requirements

The university requirements for the bachelor's degree including statements of academic standards the university residence requirement the English proficiency requirement, and the library requirement appear on page 52

Curriculum in Liberal Arts and Sciences

To obtain a baccalaureate degree from the College of Liberal Arts and Sciences, curriculum in liberal arts and sciences an undergraduate student must earn a minimum of 124 5 semester credits including a minimum of 32 semester credits earned in residence at Iowa State University In addition the student must meet general education English proficiency library proficiency foreign language and advanced credit requirements as well as the requirements of a major Courses taken on a pass/not pass basis may be counted toward the required total of 124 5 credits, and may be used to meet the advanced credit requirement if appropriate but may not be used to satisfy any other graduation requirement No more than 9 credits of 490 (Independent Study) courses in a single discipline may be counted toward graduation

General Education Requirements

Students must earn the minimum credits listed in each of the four general education groups in courses outside the department of the first major listed on the degree program Interdisciplinary courses may be used to satisfy requirements in any group for which they have been approved but a student may not apply the same course to more than one group

Credit by Examination Program

Individual departments may use CLEP Subject Tests for testout of specific courses Students in the College of Liberal Arts and Sciences may use CLEP General Test credits as free electives but not toward any of the general education group requirements

General Education Groups

I Arts and humanities (minimum 12 credits) The student should develop an understanding of human cultural heritage and history and an appreciation of reasoning and the aesthetic value of human creativity *

II Verbal communication (minimum 2 credits) The student should develop skill in and an understanding of the principles involved in effective communication among people *

III Natural sciences and mathematical disciplines (minimum 11 credits including 3 in the mathematical disciplines and 8 in the natural sciences) The student should experience science as a rational search for understanding the structure and behavior of the natural world and should appreciate mathematics as a valuable tool of the sciences and as an intrinsically important way of thinking *

IV Social sciences (minimum 9 credits) The student should develop an appreciation of the principal methods of studying human behavior and an understanding of the structure and functioning of institutions Courses must be taken in at least two disciplines represented in Group IV *

*Lists of approved courses are available from advisers or the Office of the Dean College of Liberal Arts and Sciences

Other Requirements

English Proficiency

The faculty of Iowa State University believes that its graduates should acquire competence in written communication during their undergraduate careers All students must earn an average grade of C– or better in required basic composition courses (e g Engl 104 and 105) This should be regarded as a minimally acceptable grade average Departments may have stricter criteria as appropriate to their disciplines

The continued development of communication skills following the freshman year is the responsibility of the student s major department The department shall promote this development by adopting measures to certify the writing proficiency of its own majors Certification is to occur a reasonable time before graduation and shall be based upon satisfactory completion of an advanced writing course (e g Engl 204 302 305 or 314) or a designated course in the student s program (other than an English writing course) in which writing is evaluated

Library Proficiency

A library minimum proficiency requirement must be met by satisfactory completion of one of the following options

1 Library 160

2 A test-out examination for credit to be administered by the library staff, who will control the testing procedure and will determine those students who are eligible to take the examination

Foreign Language Requirement

To obtain a baccalaureate degree from the College of Liberal Arts and Sciences a student must satisfy a graduation requirement equivalent to the first year of university-level study in one foreign language (normally completion of a two-semester sequence in any one foreign language)

The requirement may be met by completion of three or more years of high school study in one foreign language To make this feasible prospective students are encouraged to begin foreign language training as early as possible in their academic careers Students who have a strong foreign language preparation may attempt to acquire college credit by taking the test-out examination administered each semester by the Department of Foreign Languages and Literatures

Students who have completed two years of high school study in one foreign language may choose to satisfy the foreign language requirement by (a) satisfactory performance on the foreign language examination administered by the Department of Foreign Languages and Literatures (b) passing each course of a two-semester university-level sequence (101 102) or equivalent (160 110) or (c) passing any one semester of a foreign language course at the 200 level or higher (Courses taught in English are excluded from being used in this manner)

Students who have completed three or more years of French German or Spanish in high school may not receive **graded** credit for 101-102 in those languages test-out credit (T credit) may be obtained by passing an appropriate examination or by completing an advanced sequence (200-level or higher) in that language If these students choose to take 101-102 on a remedial basis they will be graded S-F

Credits applied toward the foreign language requirement cannot be used to satisfy the general education requirements but students who have fulfilled the foreign language requirement may apply additional courses in foreign languages toward the appropriate general education groups

Majors in any foreign language are deemed to have fulfilled the college foreign language requirement International students for whom English is a second language may satisfy the foreign language requirement by completion of Engl 104 and 105 at ISU with an average grade of C– or better See *Foreign Languages and Literatures* for additional information on international students

Advanced Credit Requirements

To obtain a baccalaureate degree from the College of Liberal Arts and Sciences curriculum in liberal arts and sciences a student must earn at least 47 credits at the 300 level or above Credits earned in electives taken on a pass/not pass basis or in the major or a minor may be used to meet this requirement Transfer credits applied toward the advanced credit requirement must be from a four-year college

Major

Students must complete the requirements of a major which will include 24 to 48 credits in the major discipline as specified by the major department or program Some courses outside the major discipline may also be required as supporting work for the major (See *Index* for page reference to individual department and program requirements) The major must contain at least 8 credits in courses taken at Iowa State University that are numbered 300 or above and in which the student s grade is C or higher In addition the average grade of all courses in the major (those courses listed under *major* on the degree audit) must be 2 0 or higher Courses in the department or discipline of the first major listed on the degree program may not be counted in the general education groups Courses in general education may be counted in meeting the requirements of additional majors

The major shall be chosen from the following list which also indicates the degree(s) offered in the respective majors

Advertising B A
Anthropology B A B S
Biochemistry B S
Biological/Pre-Medical Illustration B A
Biology, B S
Biophysics B S
Botany B S
Chemistry B A, B S
Computer Science B S
Earth Science B A B S
Economics B A B S
English B A B S
Environmental Studies (may be taken as a second major with the degree to be determined by the first major)
French, B A
Genetics B S
Geology B S
German B A
History B A B S
Interdisciplinary Studies B A B S
International Studies (may be taken as a second major with the degree to be determined by the first major)
Journalism and Mass Communication B A B S
Linguistics B A
Mathematics B S
Meteorology, B S
Microbiology B S **
Music B A B Mus
Naval Science, B S
Philosophy B A
Physics B S
Political Science B A
Psychology B S
Religious Studies B A
Russian B A
Social Work B A B S
Sociology B A, B S
Spanish B A
Speech Communication B A B S
Statistics B S
Zoology B S

**Available only to students who were enrolled as majors before the 1993 1994 year (See *Index Microbiology Courses and Programs*)

The major in interdisciplinary studies (B A B S) is available for undergraduate students who have interdisciplinary educational goals that cannot be met by a reasonable combination of existing majors minors and electives (See *Index Cross-Disciplinary Studies*)

Students may elect a second major from the departments and program areas listed above, or from a major field offered for the bachelor s degree in another college of the university Both major departments must then approve the degree program and if those majors involve two colleges both deans must approve Such programs must fulfill the general education requirements of the college of the primary major If one major leads to the B A degree and the other to the B S degree the degree awarded will be the one offered by the department of the primary major If the primary major may lead to either a B A or a B S a student may choose to receive either degree In all cases the student must satisfy the requirements of each major and of the degree that is chosen for the primary major

A student may earn two degrees in this curriculum with two appropriate majors and at least 30 additional credits Either the B A or the B S in this curriculum may be earned with the bachelor of music Any degree offered by this college may be earned together with a degree with a major in any other college of the university For the requirements for two degrees see *Index Bachelor s Degree Requirements*

Minor

A minor which is optional must consist of at least 15 credits with at least 6 credits in courses numbered 300 and above taken at ISU with a grade of C or higher (See also the university policy on minors, page 52)

A minor may be chosen from the following list (see *Index Courses and Programs* for the specific department or program)

Advertising
African American Studies
American Indian Studies
Anthropology
Astronomy
Biochemistry
Biological Illustration
Biology
Botany
Chemistry
Classical Studies
Computer Science
Criminal Justice Studies
Economics
English
Environmental Studies
French
Genetics
Geology
German
History
International Studies
Journalism and Mass Communication
Latin
Linguistics
Mathematics
Meteorology
Music
Naval Science
Philosophy
Physics
Political Science
Portuguese
Psychology
Religious Studies
Russian
Sociology
Spanish
Speech Communication
Statistics
Technology and Social Change
Women s Studies
Zoology

Courses applied toward the general education groups may be used to meet the requirements of a minor (For restrictions see the university policy on minors page 52)

If a student declares a minor and completes the requirements specified by the offering department/program the minor will be recorded on the transcript

Electives

Students will take additional courses freely elected sufficient to accumulate a total of 124 5 credits These additional courses together with the general education courses may be used to meet the requirements of a minor or of another major provided that they are taken on a graded basis

Planning the Program of Study

Careful comprehensive planning is important for meeting graduation requirements and taking advantage of the resources offered by the university Each student is encouraged to work with his or her academic adviser in developing a four year plan as soon as possible after declaration of the major A degree audit listing all completed courses and those remaining to be taken for fulfillment of the degree requirements in the student s chosen major is provided to the student and the adviser each semester The student should review the audit each semester and consult with the adviser when changes are required Any changes to the audit must be approved by the academic adviser and by the dean s office It is essential that the audit be reviewed and updated in a timely fashion in order to avoid delay in the student s graduation

During the first year students should meet proficiency requirements in English and in library They should also make progress toward meeting the general education requirements a large part of which should be completed by the end of the second year The third and fourth years should emphasize completion of the major (and minor if elected) and of general education requirements and should give the student an opportunity to take electives

The Open Option

Recognizing the fact that many students entering Iowa State University will not have selected a major the College of Liberal Arts and Sciences provides the open option in order to give them time to explore possible majors and programs Open option students who enter as freshmen are expected to declare a major by the beginning of the third semester of enrollment Entering students who have completed three semesters in another school and students who wish to change majors but are not yet ready to declare the new major may register under the open option for one semester provided they have completed no more than 75 credits

Program planning information is available through advisers of open option students in departmental offices and in the office of the dean of the College of Liberal Arts and Sciences *Early enrollment in certain course sequences is essential for students who are considering sciences or mathematical disciplines, and selection of a major field by the end of the first year is strongly recommended*

Honors Program

For information on the Honors Program in the College of Liberal Arts and Sciences see *Index Liberal Arts and Sciences Cross-Disciplinary Programs, Honors Program*

ROTC Programs

The College of Liberal Arts and Sciences also offers students the opportunity to combine their academic programs with ROTC programs in the Army Navy and Air Force

Teacher Licensure

Students in the College of Liberal Arts and Sciences may be recommended for the Iowa Professional License for full-time teaching of certain subjects in secondary schools For further information see *Index Teacher Education Courses and Programs*

Preprofessional Programs

Students in the College of Liberal Arts and Sciences may participate in preprofessional programs in human health-related fields law and theology by taking the courses required for admission to professional schools Students may enter the college with the designation *Premed Prelaw,* or *Preprofessional Health Programs* Most will earn a bachelor s degree by choosing a major and meeting the requirements for the major while taking the preprofessional courses Others will spend one to three years as students in the college before transferring to a professional school to which they have applied and been accepted For further information see *Index Preprofessional Study*

Curriculum in Music

This curriculum leads to the degree bachelor of music and is an alternative to the curriculum in liberal arts and sciences with a major in music To obtain a bachelor of music degree a student must earn a minimum of 124 5 credits including a minimum of 32 credits in residence at Iowa State University and a minimum of 47 advanced credits (credits in courses numbered 300 or above) and must meet all of the requirements specified below Courses taken on a pass/not pass basis may be counted toward the required total of 124 5 credits and may be used to meet the advanced credit requirement if appropriate, but may not be used to satisfy any other graduation requirement No more than 9 credits in 490 (Independent Study) courses in a single discipline may be counted toward graduation *See Music Courses and Programs*

A minor in music is available the requirements appear under *Music Courses and Programs*

Cr	Degree Requirements
32	General Education Requirements (Students choosing the music education option should consult their advisers regarding general *education requirements*)
6	Social sciences
6	Humanities
6	Music 383 384
9	Phys 198 mathematical physical and biological sciences
5	**Electives**
6 5-14 5	**Other Requirements**
6	Engl 104, 105
0 5	Library 160
0-8	Foreign language (one)*
46	**Music core**
21	Music 120 233 234 235 236 333 334 335 336 361
12	Music 119 219 319 419
3	One of the following Music 472 473 474 475
13	One of the following Music 430 440 448
7	Ensembles
34-35	**Music major** (select one of the following options)
35	**Music education**** Licensure options
35	(1) Vocal K-6 (a) Music 266 El Ed 204 301 406 (b) LAS 417L electives 3 credits*** (c) Music 360 362A 465 466 4 additional credits in applied music music electives 3 credits
35	(2) Vocal 7-12 (a) Music 266 SecEd 204 301 406, 415 (b) LAS 417K SecEd 426 (c) Music 360 362A 465 466 4 additional credits in applied music music electives 3 credits
35	(3) Instrumental K-6 (a) Music 266 El Ed 204 301 406 (b) LAS 417L elective 3 credits *** (c) Music 350 351 352 353, 354 355 356 362B 464, 466
35	(4) Instrumental, 7-12 (a) Music 266 SecEd 204, 301 406, 415 (b) LAS 417K SecEd 426 (c) same as (c) above
34	**Organ**
4	Music 119B 219B
8	Music 319C 419C
8	Music 417 472 elective in music history
3	Additional music theory
8	Additional foreign language
3	Electives
34	**Piano**
12	Music 119 219 319 419
9	Music 417 independent study (literature and pedagogy)
3	Music 321 290F (chamber music and accompanying)
3	Additional music theory
7	Electives
34	**String instruments**
12	Music 119 219 319 419
6	Music 181 321
3	Additional music theory
4	Music 417 independent study (literature and pedagogy)
9	Electives
34	**Composition**
8	Applied music
4	Music 362A 362B
13	Additional music theory and composition
9	Electives
34	**Voice**
4	Music 119B
8	Music 319A 419A
6	Music 324 325 360
3	Additional music theory
2	Music 417 independent study (literature and pedagogy)
8	Additional foreign language
3	Electives
34	***Wind or percussion* instrument**
12	Music 119 219 319 419
2-4	Music 351-352 or 353-354 or 355 356
3	Music 321
3	Additional music theory
4	Music 417 independent study (literature and pedagogy)
8-10	Electives
124 5-127 5	**Total credits**

*The requirement may be met by completion of three or more years of high school study in one foreign language Prospective students are encouraged to begin foreign language training as early as possible in their academic careers Students who have a strong foreign language preparation may attempt to acquire college credit by taking a test-out examination which is administered each *semester by the Department of Foreign Languages* and Literatures

**Because of overlapping requirements in the K-6 and the 7 12 licensure options (35 credits each) students who complete both options will earn an actual total of 42 credits including 16 weeks of student teaching *Those seeking only K-6 or 7 12* licensure will complete 12 weeks of student teaching All students will complete at least 50 hours of field experiences of which at least 40 hours must occur after admission to teacher education but before student teaching Music education students should refer to the *Teacher Education* section of this catalog for further information

***Students pursuing both K-6 and 7-12 licensure should take SecEd 426

Bachelor of Liberal Studies

The bachelor of liberal studies degree (B L S) was established in 1977 by the Iowa Regent universities and approved by the State Board of Regents to meet the needs of thousands of Iowans who want to earn a college degree but whose circumstances present obstacles to enrollment in traditional on-campus degree programs

The B L S degree is designed specifically for those individuals with 62 semester hours or more of the college credit already earned that may be applied toward a liberal arts degree Each of the Iowa Regent institutions can award the degree Iowa State University by the College of Liberal Arts and Sciences The University of Iowa, by the College of Liberal Arts and the University of Northern Iowa by the entire institution

Up to three-fourths of the total degree requirements can be transferred from accredited institutions Work done in community colleges private colleges or other accredited colleges out-of-state can be applied toward the degree as can applicable courses taken at any of the three Iowa Regent universities whether on or off campus

The B L S program has no residence requirements To complete the degree students may offer credits earned in various study formats correspondence courses telecourses Saturday and evening courses, off-campus courses including those with distance-learning formats and regular on-campus courses Students may also earn credits by proficiency or test-out examinations

The B L S offers an opportunity to earn a broadly based degree in the liberal arts without a traditional major Many groupings of courses are possible within the B L S framework Each student s educational goals will be reviewed at the time of admission and advisers will help applicants develop programs of study that best fit their individual needs and goals

Admission

Admission to the B L S program is open to persons who meet either of the following levels of previous educational attainment

Hold the associate in arts (A A) or associate in science (A S) degree from an accredited two-year college (Holders of the associate in applied science or associate in applied arts degree are not automatically eligible although some courses may be found applicable upon review)

Have at least 62 semester credits of collegiate work acceptable toward graduation at the chosen Regent university with a total cumulative grade point average of at least 2 00 (a C average)

Requirements for the B.L.S. Degree

The B L S candidate must earn a total of 124 credits in accordance with requirements listed below Courses taken at Iowa State University on a pass/not pass basis may be counted toward graduation only as electives No more than 9 credits of 490 (Independent Study) courses in a single discipline may be counted toward graduation

Cr	
48	**General Education Requirements**
6	Basic English composition
8	Foreign language*
12	Arts and humanities
2	Verbal communication
3	Mathematics statistics or computer science
8	Natural sciences
9	Social sciences from at least two different disciplines
	A list of courses acceptable in the general education groups can be obtained from 204 Carver Hall
36	**Distribution Requirements**
	A minimum of 12 credits is required in each of three of the five distribution areas listed below
	Humanities (literature philosophy history religion)
	Communications and arts (journalism speech writing drama art)
	Natural sciences and mathematical disciplines (chemistry biology geological and atmospheric sciences mathematics statistics)
	Social sciences (sociology psychology economics political science)
	Professional fields (business education family and consumer sciences social work agriculture)
	At least 24 upper-level credits are required in the three distributions areas with a minimum of 6 upper-level credits in each of the areas
40	**Electives**
124	**Total credits required for graduation**

*The requirement may be met by completion of three or more years of high school study in one foreign language

Other Requirements

Included in the total of 124 credits must be the following

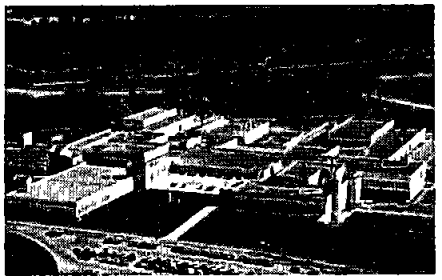
45 upper-level credits from a four-year college

45 credits from the Iowa Regents universities

30 credits from ISU after admission to the B L S program (This may be waived if sufficient ISU credit has been accumulated)

A grade average of at least 2 00 (a C average) in all coursework applied to the B L S degree in all upper-level coursework and in all work completed after admission to the B L S program

Each student must demonstrate proficiency in English by completing an advanced composition course or any course requiring extensive writing from a four-year college



College of Veterinary Medicine

Richard F Ross Interim Dean
Donald D Draper Associate Dean
Gary D Osweiler *Interim Associate Dean*

Departments of the College

Microbiology Immunology and Preventive Medicine
Veterinary Anatomy
Veterinary Clinical Sciences
Veterinary Pathology
Veterinary Physiology and Pharmacology

Other units of the college include the Veterinary Medical Research Institute the Veterinary Medical Diagnostic Laboratory the Veterinary Teaching Hospital Veterinary Extension Laboratory Animal Resources and Biomedical Communications The college also participates in interdisciplinary programs in biomedical engineering toxicology immunobiology and neuroscience

The educational mission of the college is to provide a veterinary medical sciences curriculum that incorporates basic biomedical and clinical principles clinical decision making skills and exceptional clinical tracks in production medicine companion animal medicine and surgery and equine medicine and surgery The college is uniquely qualified to provide education in veterinary medicine Located in the heart of one of the world s most intensive livestock producing areas the college provides diverse and extensive production animal medicine experiences and numerous diagnostic cases for study A nearby metropolitan area and a regionally recognized referral hospital and community practice provide experience in companion animal and equine medicine and surgery

The professional curriculum is a progressively integrated four-year course of study leading to a doctor of veterinary medicine degree Students are admitted into the fall semester of the first year of the professional curriculum after completing a minimum of 60 semester credits in a preprofessional program A strong and reputable basic science education during the first two years of the professional curriculum prepares veterinary students for a wide range of clinical experience during the last two years of the educational program The students education is enhanced during the fourth year of the curriculum by participation in preceptorships in private practice other colleges research laboratories industry or government agencies Outstanding research programs in neuroscience immunobiology infectious diseases and numerous other areas provide opportunities for qualified students to participate in research

A concurrent D V M /M S Ph D program is available for exceptionally qualified students who wish to obtain both veterinary and graduate degrees Students must have a bachelor s degree or a minimum of 128 semester credits in preveterinary and professional curricula in order to participate in the concurrent degree program Admission to the concurrent D V M /graduate degree program is subject to the approval of the dean of the College of Veterinary Medicine and the dean of the Graduate College

The College of Veterinary Medicine is an important recruiting center for employers seeking veterinarians for private practice industry educational institutions international agencies federal state and local governments the armed forces departments of public health zoological gardens laboratory animal medicine agencies and other related fields of professional activity Graduates are highly sought after and typically have six to ten employment offers A career development and computerized placement service is available to help match students with appropriate employers

Preveterinary Medicine Preparation

Admission Requirements

The College of Veterinary Medicine seeks students with diverse backgrounds and encourages students to enroll in baccalaureate programs in the college of their choice Preveterinary students are strongly encouraged to complete a bachelor s degree before enrolling in the College of Veterinary Medicine When deciding which major to pursue as an undergraduate the preveterinary student should consider the area of veterinary medicine in which they intend to specialize when they become a veterinarian For example those interested in food animal practice may wish to pursue a degree in biological science animal science agricultural economics or business Future companion animal practitioners may wish to consider a biological science physical science business social science or humanities degree These examples are only suggestions They should be considered as but a few of the numerous possibilities

Applicants for admission to the College of Veterinary Medicine must have attended a regionally accredited college or university have completed 40 semester credits prior to the deadline for filing an application for admission and have completed 60 semester credits prior to June 15 of the year in which the applicant seeks to be admitted to the College of Veterinary Medicine Credits earned must include the following Iowa State semester course offerings or their equivalents

English Composition (Engl 104 and 105)	6 sem cr
General Chemistry with Laboratory (Chem 177-177L, 178)	8 sem cr
Organic Chemistry with Laboratory (Chem 331 333A 332*)	4 sem cr
General Physics with Laboratory (Phys 111 112)	8 sem cr
Biology (Biol 201 201L 202 202L)	8 sem cr
Genetics (Gen 330 or Biol 301)	3 sem cr
Humanities or Social Sciences	9 sem cr

*Organic Chemistry 332 is highly recommended and can be taken on the pass not pass grading system

Credits in the previously specified courses will normally be earned on the traditional four-letter grading system with A as the highest grade and D as the lowest passing grade However credits earned by the credit by examination program in accordance with the regulations relating to this procedure at Iowa State University are also acceptable Credits in the preceding specified courses will not be accepted if earned under the pass-not pass grading system or similar options

Application and Admission

Request for the professional curriculum application packet should be addressed to the Director of Admissions 100 Alumni Hall Iowa State University Ames Iowa 50011 Completed applications and all supporting transcripts must be received by the Director of Admissions by December 1 of the year prior to the year in which the applicant seeks to be admitted

All preveterinary requirements must be fulfilled by the time of filing or scheduled for completion by June 15 of the year in which the applicant seeks to be admitted A list of courses in progress at the time of filing or scheduled for completion by June 15 should accompany the application and transcripts Preprofessional college credits must average at least 2 50 on a 4 00 marking system for the application to be accepted The preceding scholastic requirements are minimum and do not assure admission even though these requirements have been fulfilled

Admission to the College of Veterinary Medicine is on a competitive and selective basis Scholastic performance in preprofessional courses and general achievement are given consideration in the selection of candidates

The majority of the positions in the entering class are reserved for residents of Iowa The state of North Dakota has a contract for ten students in each entering class In addition a number of positions are available to residents of other states A few highly qualified international students may also be accepted Consideration is given equally to all applicants without regard to race color creed sex national origin disability or age

Curriculum in Veterinary Medicine

Leading to the degree doctor of veterinary medicine

First Year

Cr	Fall
2	Ethical Issues in Veterinary Medicine—Phil 303
4	Microscopic Anatomy—V An 306
5	Principles of Morphology—V An 305
4	Physiological Chemistry—B B 420
R	Professional Orientation—V Med 300
R	Seminar—V C S 385
15	

Cr	Spring
4	Comparative Veterinary Physiology—V P P 349
4	Comparative Veterinary Physiology—V P P 350
2	Veterinary Immunology—MIPM 380
1	Radiology—V C S 391
2	General Pathology—V Pth 342
2	Neuroanatomy—V An 307
R	Seminar—V C S 385
15	

Second Year

Cr	Fall
3	Comparative Veterinary Physiology—V P P 353
5	General Pharmacology—V P P 360
3	Systemic Pathology—V Pth 372
5	Veterinary Microbiology I—MIPM 386
R	Seminar—V C S 385
16	

Cr	Spring
3	Anatomy of Companion Animals—V An 321 or Anatomy of Food and Fiber Producing Animals—V An 322
1	Pharmacology and Therapeutics—V P P 361
5	Veterinary Parasitology—V Pth 376
4	Veterinary Microbiology II—MIPM 387
3	Public Health—MIPM 388
4	Surgery and Anesthesiology—V C S 397
R	Seminar—V C S 385
20	

1	Electives—minimum accumulated

Third Year

Cr	Fall
3	Clinical Pathology—V Pth 425
2	Infectious Diseases and Preventive Medicine—MIPM 436
5	Clinical Medicine I—V C S 444
4	Special Surgery—V C S 441
3	Disturbances of Reproduction—V C S 450
1	Animal Reproduction Laboratory—V C S 447
R	Introduction to Clinics—V C S 440
R	Seminar—V C S 385
18	

Cr	Spring
4	Special Pathology—V Pth 422
3	Infectious Diseases and Preventive Medicine—MIPM 437
5	Clinical Medicine II—V C S 445
3	Veterinary Toxicology—V Pth 426
3	Surgery Laboratory—V C S 449
2	Radiology—V C S 448
R	Seminar—V C S 385
20	

5	Electives—minimum accumulated

Fourth Year

The fourth year of the veterinary medical curriculum is designed to be flexible and to provide for species tracking Students must complete 38 credits during their fourth year They must take a required block and at least one option block The remainder of the fourth year credits are acquired by selecting additional option blocks elective clinical assignments or electives The maximum number of elective clinical assignment credits that can be taken is 10 Up to 6 of the 10 elective clinical assignment credits can be earned at government agencies research laboratories and other university hospitals A production medicine elective is offered as an 8 week elective once each year As many as 7 of the elective clinical assignment credits can be applied toward the general veterinary curriculum requirement of 12 elective credits

Required Block

Cr	
3	Anesthesiology—V C S 466
3	Radiology—V C S 460
1	Necropsy Laboratory—V Pth 456
1	Laboratory in Clinical Microbiology—MIPM 485
4	Intensive Care—V C S 468
1	Clinical Pathology—V C S 457
1	Laboratory in Public Health—MIPM 486
R	Seminar—V C S 495

Small Animal Option Block

Cr	
2	Small Animal Soft Tissue Surgery—V C S 455
2	Small Animal Orthopedic Surgery—V C S 456
2	Ophthalmology—V C S 469
3	Small Animal Medicine I—V C S 453
3	Small Animal Medicine II—V C S 454

Food Animal Option Block

Cr	
2	Food Animal—V C S 459
2	Field Services—V C S 467
2	Theriogenology—V C S 461
2	Diagnostic Laboratory—V Pth 455

Equine Option Block

Cr	
3	Equine Medicine—V C S 457
3	Equine Surgery—V C S 458
38	Required
12	Electives—minimum accumulated

Graduation Requirements

To be awarded the degree doctor of veterinary medicine candidates must have passed all required courses in the curriculum in veterinary medicine have earned at least 12 elective credits on a graded basis of A B C D while enrolled in the College of Veterinary Medicine have at least a 2 0 grade-point average in the veterinary medicine curriculum and passed the prescribed comprehensive examinations during the fourth year

Reinstatement

Any student who voluntarily withdraws from the College of Veterinary Medicine or who is dropped for cause forfeits his/her standing and must make written application for reinstatement to this college 45 or more days prior to the opening of the semester

Veterinary Medical Societies

All veterinary students are encouraged to become active members of the Iowa State Student Chapter of the American Veterinary Medical Association The monthly meetings of the chapter serve to promote the professional development of the members Students of veterinary medicine may also qualify for membership in the national honor societies of Phi Zeta Phi Kappa Phi Alpha Zeta and Gamma Sigma Delta Graduate students may qualify for membership in Sigma Xi

Graduate College

Patricia B Swan Dean
John M Dobson Associate Dean
George A Jackson Assistant Dean
George G Karas Associate Dean
Patricia M Keith Assistant Dean

The Graduate College at Iowa State University is responsible for monitoring the quality of graduate education for administering students graduate programs and for promoting research support from various governmental industrial and private agencies

Members of the graduate faculty have a dual role of teaching and research All courses offered for major or minor credit are taught by graduate faculty members Through a program of study committee system they supervise individual programs of study which are specially designed for each graduate student s needs

The graduate faculty includes the president the provost vice provosts and associate provosts the dean and associate deans of the Graduate College deans and associate deans of the other eight colleges the dean of library services and the directors and associate directors of research institutes as full members Executive officers of departments assistant deans and other members of the General Faculty may be elected to associate or full membership in recognition of accomplishments in their respective disciplines

Graduate study was offered soon after the university was founded and the first graduate degree was conferred in 1877 Experimentation and research also started early first in agriculture and shortly thereafter in home economics engineering science and veterinary medicine In 1913 the graduate faculty was organized formally and an executive graduate committee was appointed In 1915 the graduate faculty held its first meeting and in 1916 it granted the first doctor of philosophy degree

Graduate education is vital to the quality of university teaching The creative efforts of graduate faculty members and graduate students result in knowledge necessary to help society solve problems in educational scientific technological and socio-economic areas The Graduate College encourages educational exchange and contact with undergraduate areas of the university to promote improved teaching on both the undergraduate and graduate levels A part of this exchange is accomplished by books and technical articles which are made possible by graduate research

The degrees master of arts master of science and doctor of philosophy are research oriented In many fields master s degrees are also available without thesis but a written report of independent study called a creative component is required For those people interested in advanced study directed toward meeting vocational or professional objectives the following degrees are offered master of agriculture master of architecture master of business administration master of community and regional planning master of education master of engineering master of fine arts master of landscape architecture master of public administration master of school mathematics and specialist

Graduate Appointments

Graduate assistantships fellowships, and certain special research grants have been established at Iowa State University for the encouragement of graduate work and the promotion of research Such appointments and research opportunities are available through the various departments of instruction the Agriculture and Home Economics Experiment Station the Business Research Institute the Design College Research Institute the Research Institute for Studies in Education the Engineering Research Institute the Family and Consumer Sciences Research Institute the Liberal Arts and Sciences Research Institute the Veterinary Medical Research Institute the Statistical Laboratory the Computation Center the Ames Laboratory the Institute for Physical Research and Technology the Water Resources Research Institute the Offices of the Vice President for Student Affairs the Graduate College and other research centers on campus

A half-time graduate assistantship permits the holder to enroll for a maximum of 12 semester credits Recipients of these assistantships are assessed fees at full resident rates regardless of the number of credits for which they register Students who are graduates of a regionally accredited college or university in the United States or of a recognized institution in another country whose requirements for the bachelor s degree are substantially equivalent to those of Iowa State University who graduated in the highest quartile of their respective classes and who present the requisite undergraduate or graduate preparation may apply for these appointments Students registered on a restricted or nondegree basis and those placed on academic probation are not eligible for assistantship appointment Further information may be obtained by writing to the appropriate department chair

The satisfactory completion of one appointment plus satisfactory academic performance will ordinarily make a student eligible for reappointment After a period of three years of full time study for the master s degree or five years for the doctorate the student will not normally be continued on assistantship support The *Graduate College Handbook for Faculty and Students* discusses graduate assistantship requirements more fully Copies of this handbook may be requested from the Graduate College office

Fellowships and traineeships supported by agencies of the federal government are sometimes available Applicants for these awards must present evidence of superior scholarship

Postdoctoral Study

Opportunities are provided for postdoctoral study through the extensive research programs of the university Inquiries should be directed to the appropriate department institute or to the dean of the Graduate College

Graduate Study by Staff Members

Full-time members of the research instructional or extension staffs of the rank of instructor research associate or assistant scientist subject to the approval of the head of their department or section may become candidates for an advanced degree They may carry up to six credits of graduate work per semester and three credits per summer session provided such coursework does not interfere with other duties This privilege may be extended to members of the research instructional or extension staffs at the rank of assistant professor upon approval of the dean of the employee s college and the dean of the Graduate College

Staff members holding the rank of professor or associate professor cannot become candidates for degrees from Iowa State University

Admission

Admission to the Graduate College may be granted to a graduate of an institution in the United States which is accredited by a recognized regional association or to a graduate of a recognized institution in another country whose requirements for the bachelor s degree are substantially equivalent to those of Iowa State University For information concerning graduate study in a particular academic discipline prospective students should correspond with the chair of the department in which they wish to study

Application forms, available from the Office of Admissions, should be completed and returned to 100 Alumni Hall with a $20 application fee ($30 for international applicants) at least two months (six months for international applicants) before the opening of the term for which the student seeks admission Because some departments and programs have earlier admission deadlines the applicant should check with the appropriate departmental office for this information The application fee is required of all applicants except those who have attended Iowa State as undergraduates or those applying for nondegree admission In addition an applicant must request that each college attended send official transcripts of grades and credits earned and request that the institution from which the degree was granted provide a statement of the degree received and the applicant s quartile class rank

Categories of Graduate Admission

There are three admissions categories for students who wish to pursue an advanced degree

Full Admission status may be granted to students who meet either of the following requirements
1 Graduate in the upper one-half of the graduating class with a bachelor s degree from a regionally accredited U S institution or
2 Graduate in the upper one-half of the graduating class from a recognized foreign institution where the requirements for the bachelor s degree are similar to those at Iowa State

Provisional admission status may be granted to students who meet the requirements for full admission (listed above) but have **certain background deficiencies** to remedy Transfer from provisional admission to full admission status usually requires the completion of the graduate English requirement completion of the coursework prescribed to remedy the background deficiencies with a grade average of B or better and the written recommendation of the major professor and approval by the dean of the Graduate College

Restricted admission status may be granted to students who meet the requirements for full admission (listed above) except that they **do not rank in the upper one-half of their graduating class and/or lack adequate preparation in the proposed field of study** Advancement from restricted to full admission status requires completion of 10 semester credits of graduate level course work with a cumulative grade average of B or better and satisfaction of the Graduate College English requirement The recommendation is submitted in writing by the major professor and must be approved by the graduate dean In all of these categories the applicant must first be recommended by the department in which he/she will be pursuing an advanced degree and must be approved by the dean of the Graduate College

Nondegree admission is an admission category for graduates of regionally accredited institutions in the United States who **do not** intend to seek an advanced degree from Iowa State University Such students usually include
1 Those who intend to transfer graduate credit earned at Iowa State University to other institutions
2 Those who intend to use graduate credits earned for professional certification
3 Those who enroll for personal satisfaction
4 Those who enroll occasionally in graduate courses

Certain students admitted on a nondegree basis may not wish to declare a major Applications and schedules for such students with an **undeclared** major are processed directly by the Graduate College office no departmental signatures are required Applications and schedules for students declaring a major require departmental evaluation and approval

A nondegree student who subsequently seeks full or restricted admission must apply to and be accepted by a department and by the Graduate College for degree study A new application the application fee and transcripts from all colleges attended are required

For those students originally admitted to the Graduate College on a nondegree basis whether they are in a department or on undeclared status no more than 9 semester hours of graduate credit earned under the nondegree option may be applied if the student later chooses to undertake a graduate degree program The student s program of study committee will recommend to the Graduate College which courses (if any) taken on a nondegree basis may be included in the degree program

An applicant who is a graduate of a recognized foreign institution is subject to the same criteria for admission as a graduate from an institution in the United States and may be recommended for the same admission categories described above except that of nondegree Application and admission deadlines for international students can be obtained from the publication *Information for International Applicants*

International students are required to show evidence of financial support and to carry adequate health and accident insurance while in residence

Admission Examinations

Graduate Record Examination The Graduate Record Examination (GRE) is not a university-wide requirement for all applicants However some departments require or recommend submission of GRE scores individual departmental statements appearing in the publication *Graduate College Admissions Bulletin* should be consulted for this information

English Requirement for Native Speakers

The English requirement for native speakers is fulfilled by passing the Graduate English Examination a machine-scored test of English grammar usage and punctuation Performance on that test will determine whether a student must take an additional writing proficiency test

Students (except those admitted on a nondegree basis) should satisfy the Graduate College English requirement before completing 12 credit hours of graduate work at Iowa State University

English Requirements for Non-native Speakers

Applicants whose native language is not English and who have not earned the baccalaureate from a university where the medium of instruction is English are required to submit Test of English as a Foreign Language (TOEFL) scores as part of their application for admission A minimum score of 500 on the TOEFL is required for admission to the Graduate College Because some departments require a higher score applicants should check directly with the department to which they desire admission or see the bulletin *Information for International Applicants* for this information

Graduate students whose native language is not English and who do not have an undergraduate degree from Iowa State University must take the English Placement Test at the beginning of their first semester of enrollment This test is administered by the Department of English in lieu of the Graduate English Examination Students who do not pass this examination are assigned to one or more courses in the English 101 series This coursework must be completed during the first year of study

Graduate students whose native language is not English but who have an undergraduate degree from Iowa State University must take the Graduate English Examination for International Students also administered by the Department of English at the beginning of their first semester of graduate work Students who do not pass this examination must complete English 101D during their first year of study

New teaching assistants whose native language is not English are evaluated for their ability to communicate effectively in English before their assistantship assignment is made Tests of oral proficiency and teaching skills (SPEAK and TEACH) are given before the beginning of each semester A prospective teaching assistant who does not pass is required to complete coursework in speaking and teaching skills and must be retested

Registration

Graduate students are encouraged to register for courses through the Touch-tone Registration System Students who are unable or who choose not to register through this system may use a walk-through registration procedure Students who do not register by the published deadline for initiation of a schedule through the touch-tone system must use the walk-through procedure which differs from the touch-tone

procedure in only one important way—for walk-through registration the approved Touch-tone Registration Worksheet must be presented to the Student Scheduling Office 10 Alumni Hall where the schedule will be entered on a terminal New graduate students should report to their departmental offices for assistance in completing the ISU Touch-tone Registration Worksheet

Credit Limits Registration is limited to a maximum of 15 credits per semester Schedules for graduate assistants on one-half time appointments are limited to a maximum of 12 credits For full-time staff members the limit is 6 credits (Different credit limits apply *during the summer session, see the Graduate College Handbook for Faculty and Students* for more details)

Interim Registration Registration for special work between semesters and during certain vacation periods cannot exceed one credit for each week that the student is in residence

"In Absentia" Registration Graduate work by correspondence is not permitted nor is it accepted in transfer In absentia registration is restricted to thesis preparation after completion of research or for research under special conditions The total credit thus obtained cannot be used to reduce residence requirements

Extension and Off campus Registration Many departments offer off-campus classes taught by members of the graduate faculty For this purpose special arrangements are made for the necessary library and laboratory resources so that the classes are equivalent to those taught on campus

Continuous Registration Graduate students who have completed coursework and residence requirements are required to register and pay fees for an appropriate number of credit hours if university facilities and equipment are used or staff members consulted Continuous registration is required during the academic year after the preliminary examination is passed by the Ph D candidate even if university facilities equipment and staff time are not used Graduate students must enroll for at least minimum credit hours during the terms of the preliminary examination and final examination Registration for a workshop does not qualify as registration for the semester in which either of these examinations is to be taken

If students take the final examination during the interim between terms (including the first day of classes) registration can be for the term either before or after the examination is held

Auditing Audit registration pertains to courses that the major professor or program of study committee recommends the student audit They carry the full fee assessment on the basis of course credits and reduce the allowable course load by one credit Audited courses do not appear on the student s permanent record unless the form Request for Audit(s) to Appear on Transcript is completed and signed by the student course instructor and major professor Copies of this form are available from the Graduate College 207 Beardshear Hall

Graduate Courses Taken by Seniors Certain graduate level courses listed in the *General Catalog* may be,taken for graduate credit by undergraduate seniors at Iowa State University If a student is admitted for graduate study at Iowa State University the program of study committee at the time the program of study is submitted may request approval from the graduate dean that up to nine semester hours of such credit be applied toward meeting advanced degree requirements Credits earned in these courses must be in addition to those used to *meet requirements for the bachelor s degree* and must be so certified in writing by the Registrar s Office 10A Alumni Hall This letter must accompany the program of study when it is submitted

Admission of Undergraduates to Concurrent Graduate Degree Programs Five departments (Biochemistry and Biophysics Civil and Construction Engineering Food Science and Human Nutrition Materials Science and Engineering and Zoology and Genetics) provide opportunities for well qualified ISU juniors and seniors majoring in those curricula to apply for admission to programs leading to both an M S and a B S awarded usually at the end of a fifth year of study Students interested in a research career may apply for graduate research assistantships during their fourth and fifth years of study Students should contact the departments about applying to these programs A student in a department other than the five listed may individually design a concurrent undergraduate/graduate degree program by applying directly to the Graduate College

Special Regulations for Students in Veterinary Medicine Advanced students in veterinary medicine may request permission from the dean of the College of Veterinary Medicine and the dean of the Graduate College to pursue work concurrently toward the degrees master of science or doctor of philosophy and doctor of veterinary medicine

To participate in such a concurrent program a student must be admitted to the Graduate College and a program of study committee must be appointed according to the usual procedures A concurrent enrollment request form should be obtained from the Admissions Office and circulated for the appropriate signatures The program of study must be approved by both the Graduate College and the College of Veterinary Medicine (Please see the *Graduate College Handbook for Faculty and Students* for more information)

Admission of Graduate Students to Concurrent Undergraduate Programs Graduate students interested in enrolling in a concurrent undergraduate program should contact the Admissions Office to obtain admission information (even if the student has been previously admitted as an undergraduate) A concurrent enrollment request form should be obtained from the Admissions Office and circulated for the appropriate signatures The student must be formally admitted both as a graduate student and as an undergraduate student Official enrollment and fee payment will be as a graduate student Credits will not be transferred from the graduate permanent record to the undergraduate permanent record until after the term in which the first degree is earned The courses and grades will also appear on the graduate record but not be included in the graduate grade point average The transferred courses will not be available for use in the graduate program of study

Courses Taken as a Special Student Courses taken by a person with special student admission status may not be used in a graduate degree program Persons with a baccalaureate degree are required to register as graduate students if they take graduate credit courses

Degree Requirements

The Graduate College Handbook for Faculty and Students listing policies and procedures of the Graduate College is available in the Graduate College and in department offices Each new graduate student is urged to obtain a copy It is mailed to graduate faculty members

Probation If a graduate student does not maintain a cumulative 3 0 grade point average on all course work taken exclusive of research credit he or she may be placed on academic probation by the graduate dean Before each subsequent registration a student placed on probation must undergo department-level review which results in a recommendation to the Graduate College Improvement in academic performance must take place for registration to be approved Removal from probation is accomplished upon specific recommendation from the student s major professor to the Graduate College Doctoral students are not allowed to take preliminary examinations while on probation

Time Limits It is expected that work for the master s degree shall be completed within five years A student beginning a Ph D degree program at Iowa State with a master s degree from another institution is expected to complete the Ph D within five years while a student beginning a Ph D degree program without the master s degree is expected to complete the program within seven years In special circumstances the student s program of study committee may recommend that the graduate dean extend these degree time limits Cases in which the student leaves Iowa State during his or her graduate career and later returns are dealt with individually by the student s program of study committee and the Graduate College

Master of Arts and Master of Science

General requirements for the degrees are as follows

Appointment of the Student's Program of Study Committee As soon as practicable after the student enrolls in the Graduate College the department chair recommends to the graduate dean a committee of the graduate faculty to be in charge of the student s work

This committee consists of at least three members of the graduate faculty one of whom must be from a department other than that in which the student is enrolled At least one member of the committee should be a full member of the graduate faculty An associate member of the graduate faculty may serve as major professor for a master s degree candidate A faculty member holding a joint appointment may not serve as an outside the department member on a committee if the student s major is in either of the departments represented in the joint appointment A committee appointment form should be submitted to the Graduate College before the student s program of study is developed

Program of Study A program of study developed by the student and major professor in consultation with the program of study committee should be submitted for approval by the end of the second semester in residence

Residence There is no on-campus residence requirement for the master s degree

Credits At least 30 credits of acceptable graduate work must be completed not less than 22 of which must be earned from this institution

Any transfer of credits from another institution must be recommended in the program of study by the student s program of study committee Graduate credit will be approved for transfer only if it is of B grade or better Graduate courses taken as an undergraduate or a special student at another university cannot be transferred Graduate work by correspondence is not permitted nor is it accepted in transfer

Major The exact number of credits in a major is not prescribed To obtain the specialization which is considered essential for an advanced degree approximately two-thirds of the work should be devoted to the major field but this is not necessarily restricted to one department

Minor Requirements for declared minors are determined by the minor department or program and the faculty member representing the minor field on the student s program of study committee To have a minor placed on the transcript after graduation it must be approved on the program of study and listed on all examination reports and the diploma slip

Department Change A graduate student may change from one department to another by submitting the request form to transfer from one department or interdepartmental program to another This form requires written permission from the executive officers of departments involved and approval of the graduate dean Transfer will be processed after the student completes the degree currently being worked on unless a Request to Pursue Two Concurrent Graduate Degrees form is signed by the department executive officers of both departments and sent to the graduate dean indicating that the student will be in both departments at the same time

Foreign Language Requirement There is no uniform language requirement for the Graduate College Departmental descriptions in this catalog specify departmental requirements

The university offers the standardized examinations provided by Educational Testing Service for those departments wishing to use them and for students interested in transferring a foreign language test score elsewhere

For students whose native language is not English the ability to communicate adequately in English (as certified by the Department of English) may be accepted as a substitute for the reading knowledge of one foreign language This option applies only when specifically recommended by the master s student s program of study committee

Any foreign language requirements must be met before the semester in which the student receives the degree

Application for Graduation This procedure is accomplished by submitting a diploma slip to the Graduate Office by the end of the first week of the semester in which the student expects to receive the degree or by mid-May when planning to graduate during summer session

Thesis A thesis is required in all areas in which the M S or M A is granted except where specific provision is made for a nonthesis degree program The minimum credit requirement is three credits for a thesis and two credits for a nonthesis creative component

The student should consult *The Graduate College Thesis Manual* for instructions about thesis preparation and time schedules Copies are available at the Thesis Office 203 Beardshear and the Graduate College 207 Beardshear Joint authorship is not permitted A complete unbound copy of the thesis must be submitted to the Thesis Office for a format check by the first deposit deadline of the semester in which the student intends to graduate Copies of the completed thesis must be in the hands of the program of study committee at least two weeks before the final examination After the final examination and at least two weeks before graduation two unbound approved copies of the thesis should be deposited in the Thesis Office 203 Beardshear Hall A thesis processing fee of $45 is charged during the term in which the student intends to graduate

Final Examination After all other requirements have been met the final examination is taken covering all graduate work including the thesis where applicable It is oral but may have written sections if specified by the committee in charge

Graduation Approval Slips These slips are prepared by the Graduation Evaluation Office 10A Alumni Hall about two weeks before the end of a semester Candidates wishing to secure this form at an earlier date should file a request with the Graduate College at least one day before the form is needed

Master of Arts and Master of Science—Nonthesis

A nonthesis degree program may be undertaken in over 40 departments or interdepartmental programs This requires satisfactory completion of at least 30 credit hours of acceptable work (not including research credit) and satisfactory completion of a comprehensive examination (Some master s programs require more credit hours) Every nonthesis master's program however must present substantial evidence of individual accomplishment which may vary from a special report or an annotated bibliography to a project in research design or other creative endeavor This element of creative independent study called the creative component, must be explicitly identified on the program of study A minimum of two semester hours is required on every program of study for a nonthesis master s degree for this creative component Detailed requirements may vary with fields Reference should be made to the departmental descriptions in this catalog or in the *Graduate College Handbook for Faculty and Students*

Master of Agriculture

The major in professional agriculture is an off-campus nonthesis program leading to the master of agriculture degree It is available to students wishing to pursue graduate study in agriculture without taking formal coursework on campus The program is considered to be a terminal master s degree Students are required to take a minimum of two courses in each of three disciplines and complete 24 semester credits of formal coursework In addition a minimum of four credits of creative component experience and four credits of workshops are required resulting in a total of 32 credits of coursework Students must take two courses in each of three of the following areas agricultural systems technology agronomy animal science horticulture, and economics

Master of Architecture

The Department of Architecture offers a two part program leading to the master of architecture a professional degree Beyond the bachelor of architecture degree a minimum of 30 graduate credits is required Beyond the B A or B S degrees in architecture or environmental design a minimum of 60 credits is required For students with other baccalaureate degrees a program of more than 60 credits may be tailored to each student s experience training and education For programs of 60 credits or more 40 must be graduate credits

Master of Business Administration

The College of Business offers a 48-credit-hour program leading to a nonthesis master of business administration (M B A) degree Twenty-four credit hours of required core courses comprise the first half of the degree program Elective courses comprise the other half which students use to specialize in agribusiness management or to emphasize one of the functional areas of business Students are also expected to maintain some

breadth in their course work The program prepares students for careers in business and is open to all individuals with business or nonbusiness undergraduate degrees Undergraduates from liberal arts science and technical programs are encouraged to apply

Master of Community and Regional Planning

The master of community and regional planning degree requires 48 semester credit hours including a 9-credit thesis

Master of Education

For the master of education degree a minimum of 30 credits of graduate level courses are required The student demonstrates an ability to perform independent study through the completion of a creative component

Master of Engineering

The academic standards and the general level of attainment are the same for the master of engineering and master of science degrees Master of engineering programs are offered to meet the needs for professionally oriented programs on campus and for off-campus professionally oriented programs at locations with adequate library and laboratory facilities

An appropriate number of credit hours in *design laboratory work computation or* independent study is required as evidence of individual accomplishment

Of the minimum 30-credit requirement 22 credits must be received from Iowa State University

Master of Fine Arts

For this degree a minimum of 60 graduate credits is required This includes completion of a thesis-exhibition or a thesis

Master of Landscape Architecture

The master of landscape architecture degree requires a minimum of 36 graduate credits and the satisfactory completion of a thesis or a creative component

Master of Public Administration

This is a professional degree program designed to provide training necessary for an administrator in a public or quasi-public bureaucracy A minimum of 39 semester credit hours is required in six subject areas (See departmental handout for details) Either an internship in a governmental unit or a thesis is required

Master of School Mathematics

This degree is designed primarily for inservice secondary mathematics teachers Its prescribed program of study requires 36 credits two of which come from the writing of an approved creative component 15 from courses offered for graduate credit and 13 from courses offered for minor graduate credit At least 22 of the credits must be earned at Iowa State University

Double Graduate Degree Programs

A double degree requires fulfillment of the requirements for two graduate majors for which two differently named master s degrees and two diplomas are granted at the same time For double degrees the final project (thesis or creative component) must integrate subject areas from both departments Students planning to pursue double degrees must complete a double degree request form Just one Recommendation for Committee Appointment form and one Program of Study need to be submitted for the two degrees All *forms should show clearly that the student is* enrolled in a double-degree program Four such combinations are currently available (1) Master of Architecture/Master of Community and Regional Planning (2) Master of Architecture/Master of Business Administration (3) Master of Landscape Architecture/Master of Community and Regional Planning and (4) Master of Public Administration/Master of Community and Regional Planning Other individually combined master s degree programs are available Please see the *Graduate College Handbook for Faculty and Students* for more information

Specialist

This degree is a post-master s degree in school psychology requiring 60 semester hours of work beyond the baccalaureate A thesis equivalent to a master s thesis and an internship in the public schools of not less than 600 clock hours are required

Doctor of Philosophy

The degree doctor of philosophy is strongly research oriented The primary requirements for the degree are (1) high attainment and proficiency of the candidate in his or her chosen field (2) development of a dissertation which is a significant contribution to knowledge and which shows independent and creative thought and work and (3) successful passing of detailed examinations over the field of the candidate s major work with a satisfactory showing of preparation in related courses

Appointment of the Student's Program of Study Committee As soon as practical after the student enrolls in the Graduate College the department chair shall recommend to the graduate dean a committee of the graduate faculty to be in charge of the student s program This committee must consist of at least five members of the graduate faculty three of whom must be full members At least two committee members must be outside the declared major or area of specialization and at least one of the two must be outside the major department A faculty member holding a joint appointment may not serve as an outside the department member on a committee if the student s major is in either of the departments represented in the joint appointment An associate member of the *graduate faculty may not serve as a major* professor of a doctoral program but may co-chair a doctoral committee

Program of Study A program of study should be developed by the student in consultation with his or her major professor and committee This should be submitted for approval by the end of the second semester in residence

Credits A minimum of 72 graduate credits must be earned for a Ph D degree At least 36 credits including all dissertation research credits must be earned at Iowa State University under the supervision of the student s program of study committee Graduate credits of B grade or better earned at another institution may be transferred at the discretion of the program of study committee and the approval of the department and Graduate College Transfer of S and pass grades may be accepted for research only when such grades can be documented as being B grade or better Responsibility for submitting such documentation to the Graduate College rests with the student s program of study committee

Residence At least 24 semester credits must be earned during two consecutive semesters or during a continuous period including two semesters and a summer session This requirement does not apply to doctoral students who are employed at least half-time by Iowa State University and government laboratories located in Ames

Major A major is the area of study or academic concentration in which a student chooses to qualify for the award of a graduate degree Majors are listed for departments and interdepartmental programs in the *Courses and Programs* section of the catalog

To avoid overspecialization a significant body of pertinent coursework must be taken outside of the major field At least 12 hours of applicable graduate credit will be required by the student s committee

Opportunities also exist for majoring in more than one area of study (co-major or joint major programs)

Minor Students may declare a formal minor in any department or interdepartmental unit authorized to grant a graduate degree and in departments or interdepartmental units authorized to offer a formal minor only Requirements for declared minors are determined by the minor department or program and the faculty member representing the minor field on the student s program of study committee A doctoral student declaring a minor must pass a preliminary examination covering that area To have a minor placed on the transcript after graduation it must be approved on the program of study and listed on all examination reports and the diploma slip

Foreign Language Requirement The Graduate College has no uniform requirements Departmental foreign language requirements are specified in the individual department descriptions in the *Courses and Programs* section of this catalog

For those departments wishing to use them and for students interested in transferring a foreign language test score elsewhere the university offers the standardized examinations provided by the Educational Testing Service

For students whose native language is not English the ability to communicate adequately in English (certified by the Department of English) may be acceptable as a substitute for the reading knowledge of one foreign language This option applies only when specifically recommended by the student s program of study committee

The foreign language requirement when applicable may be fulfilled at any time but not less than six months prior to the final examination

Preliminary Examination The student must pass satisfactorily a preliminary examination before becoming a doctoral candidate This examination is comprehensive and should not be restricted only to the content of graduate courses It usually has two parts a written examination followed by an oral examination The oral examination is mandatory and all members of the student s program of study committee (or approved substitutes) must be present In some programs completion of the written examination is considered a prerequisite to taking the oral examination A preliminary examination is not scheduled for a student on provisional or restricted admission or on academic probation All students must meet the graduate English requirement before taking the preliminary examination The preliminary examination is usually given before all coursework has been completed and must be passed at least six months before the final examination Exceptions to this rule are made only upon special recommendation of the student s committee and approval of the graduate dean If a minor is declared the preliminary examination must cover both the major and minor The student must be registered for at least minimum credit hours during the semester in which the preliminary examination is taken

Application for Graduation This procedure is accomplished by submitting a diploma slip to the Graduate Office by the end of the first week of the semester in which the student expects to receive the degree or by mid-May for a student wishing to graduate during summer session

Dissertation A doctoral dissertation shall be completed on some topic connected with the major field To be acceptable it must constitute a significant contribution to knowledge Joint authorship is not permitted The student should consult *The Graduate College Thesis Manual* for instructions about dissertation preparation and time schedules Copies of the manual are available in the Thesis Office 203 Beardshear

A complete, unbound copy of the dissertation must be submitted to the Thesis Office for a format check by the first deposit deadline of the semester in which a student intends to graduate Copies of the completed dissertation must be in the hands of the program of study committee at least two weeks before the final examination Two unbound approved copies of the dissertation should be deposited in the Thesis Office 203 Beardshear after the final examination and at least two weeks before graduation

At the same time the dissertation is deposited for final deposit, two copies of an abstract meeting the requirements as set forth in *The Graduate College Thesis Manual* must also be filed with the Thesis Office A dissertation processing fee of $90 is charged during the term in which the student intends to graduate

Final Examination A final examination should be taken after the completion of all other work prescribed for the degree The student must be registered for minimum credit hours during the semester in which the final examination is taken This examination is oral however it may be both written and oral if specified by the student s committee It is intended principally as a defense of the dissertation

Graduation Approval Slip These slips are prepared by the Graduation Evaluation Office 10A Alumni Hall about two weeks before the end of a semester Candidates wishing to secure this form at an earlier date should file a request with the Graduate College office at least one day before the form is needed

Summary of Graduate Programs Within Administrative Units*

Aerospace Engineering and Engineering Mechanics—M Eng , M S , Ph D — Aerospace Engineering Engineering Mechanics

Agricultural Education and Studies—M S , Ph D —Agricultural Education

Agricultural and Biosystems Engineering—M Eng , M S , Ph D —Agricultural Engineering Agricultural Systems Technology (minor only) Water Resources **

Agronomy—M S , Ph D —Agricultural Meteorology, Crop Production and Physiology Ecology and Evolutionary Biology ** Genetics ** Molecular Cellular and Developmental Biology ** Plant Breeding Plant Physiology ** Soil Science Water Resources **

Animal Ecology—M S , Ph D —Animal Ecology Ecology and Evolutionary Biology ** Fisheries Biology Toxicology ** Water Resources ** Wildlife Biology

Animal Science—M S , Ph D —Animal Breeding Animal Nutrition Animal Production (M S only) Genetics ** Meat Science (joint major) Molecular Cellular and Developmental Biology,** Muscle Biology Nutritional Physiology Physiology of Reproduction Toxicology **

Anthropology—M A —Anthropology

Architecture—M Arch , M S —Architecture (M Arch only) Architectural Studies (M S currently inactive)

Art and Design—M A , M F A —Art and Design (M A only) Graphic Design (M F A) Interior Design (M F A)

Biochemistry and Biophysics—M S , Ph D —Biochemistry Biophysics Genetics ** Molecular Cellular and Developmental Biology ** Plant Physiology ** Toxicology **

Biomedical Engineering (interdepartmental program)—M S , Ph D —Biomedical Engineering

Botany—M S , Ph D —Botany Ecology and Evolutionary Biology ** Genetics ** Molecular Cellular and Developmental Biology ** Plant Physiology ** Toxicology ** Water Resources **

Business Administration—M B A , M S — Business Administration (M B A) Business Administrative Sciences (M S)

Chemical Engineering—M Eng , M S , Ph D —Chemical Engineering

Chemistry—M S , Ph D —Analytical Chemistry Chemistry Organic Chemistry Inorganic Chemistry Physical Chemistry Toxicology **

Child Development—see Human Development and Family Studies

Civil and Construction Engineering—M S , Ph D —Civil Engineering Transportation Planning (M S only) ** Water Resources **

Community and Regional Planning—M C R P , M S —Community and Regional Planning (M C R P) Transportation Planning (M S only) **

Computer Science—M S , Ph D —Computer Science

Curriculum and Instruction—See Education

Ecology and Evolutionary Biology (interdepartmental major)—**M S , Ph D —** Ecology and Evolutionary Biology

Economics—M S , Ph D —Agricultural Economics Economics

Education—M Ed , M S , Ph D —Offered by Curriculum and Instruction and Professional Studies in Education

Electrical Engineering and Computer Engineering—M Eng , M S , Ph D — Electrical Engineering Computer Engineering

Engineering Mechanics—see Aerospace Engineering and Engineering Mechanics

English—M A , Ph D —English (M A) Rhetoric and Professional Communication (Ph D)

Entomology—M S , Ph D —Ecology and Evolutionary Biology,** Entomology Genetics ** Toxicology **

Family and Consumer Sciences Education and Studies—M Ed , M S , Ph D —Home Economics Education

Family Environment—see Human Development and Family Studies

Food Science and Human Nutrition—M S , Ph D —Food Science and Technology Genetics ** Meat Science (joint major Ph D) Molecular Cellular and Developmental Biology ** Nutrition Toxicology **

Forestry—M S , Ph D —Ecology and Evolutionary Biology ** Forestry Genetics ** Plant Physiology ** Water Resources **

General Graduate Studies (interdepartmental program)—**M A , M S** — *General Graduate Studies*

Genetics (interdepartmental major)— M S , Ph D —Genetics

Geological and Atmospheric Sciences—M S , Ph D —Earth Science Geology Meteorology Water Resources **

Gerontology—interdepartmental minor only

History—M A , Ph D —History (M A only) History of Technology and Science Agricultural History and Rural Studies (Ph D only)

Horticulture—M S , Ph D —Genetics ** Horticulture Plant Physiology ** Water Resources **

Hotel, Restaurant, and Institution Management—M S , Ph D (joint major Ph D)—Hotel Restaurant and Institution Management

Housing—interdepartmental minor only

Human Development and Family Studies—M S , Ph D —Human Development and Family Studies

Immunobiology (interdepartmental program)—**M S , Ph D** —Immunobiology

Industrial Education and Technology—M S , Ph D —Industrial Education and Technology

Industrial and Manufacturing Systems Engineering—M Eng , M S , Ph D — Industrial Engineering Operations Research (joint major with Department of Statistics M S only)

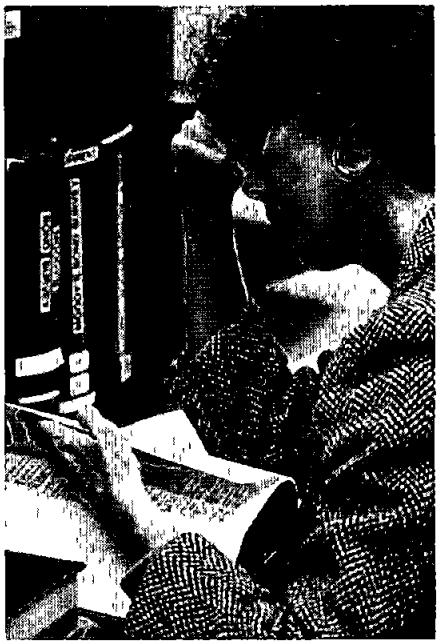
Industrial Relations (interdepartmental program)—**M S** —Industrial Relations

Journalism and Mass Communication—M S —Journalism and Mass Communication

Landscape Architecture—M L A — Landscape Architecture

Materials Science and Engineering—M S , Ph D —Ceramic Engineering Metallurgy

Mathematics—M S , M S M , Ph D — Applied Mathematics (M S Ph D only) *Mathematics* (M S Ph D only) School Mathematics (M S M only)



Mechanical Engineering—M S , Ph D — Mechanical Engineering Nuclear Engineering

Microbiology, Immunology and Preventive Medicine—M S , Ph D —Genetics ** Immunobiology ** Microbiology Molecular, *Cellular and Developmental Biology* ** Toxicology ** Veterinary Microbiology Veterinary Preventive Medicine (M S)

Mineral Resources—interdepartmental minor only

Molecular, Cellular, and Developmental Biology (interdepartmental major)—**M S , Ph D** —Molecular Cellular and Developmental Biology

Nuclear Engineering—see Mechanical Engineering

Philosophy—minor only

Physical Education and Leisure Studies—M S —Physical Education

Physics and Astronomy—M S , Ph D — Applied Physics Astrophysics High Energy Physics Nuclear Physics Physics Condensed Matter Physics

Plant Pathology—M S , Ph D — Genetics ** Molecular Cellular and Developmental Biology ** Plant Pathology Plant Physiology ** Toxicology **

Plant Physiology (interdepartmental major)—**M S , Ph D** —Plant Physiology

Political Science—M A , M P A —Political Science (M A only) Public Administration (M P A only)

Professional Agriculture (interdepartmental program)—M Ag — Professional Agriculture

Professional Studies in Education—See Education

Psychology—M S , Sp , Ph D —Psychology (M S Ph D) School Psychology (Sp only)

Sociology—M S , Ph D —Rural Sociology, Sociology

Speech Communication—Minor only

Statistics—M S , Ph D —Genetics ** Operations Research (joint major with Department of Industrial and Manufacturing Systems Engineering M S only) Statistics

Technology and Social Change— Interdepartmental minor only

Textiles and Clothing—M S , Ph D — Textiles and Clothing

Toxicology (interdepartmental major)—**M S , Ph D** —Toxicology

Transportation Planning (interdepartmental major)—**M S** —Transportation Planning

Veterinary Anatomy—M S , Ph D — Molecular Cellular and Developmental Biology ** Toxicology ** Veterinary Anatomy

Veterinary Clinical Sciences—M S — Veterinary Clinical Science

Veterinary Pathology—M S , Ph D — Veterinary Pathology, Toxicology **

Veterinary Physiology and Pharmacology—M S , Ph D —Molecular Cellular and Developmental Biology ** Toxicology ** Physiology

Water Resources (interdepartmental major)—**M S , Ph D** —Water Resources

Zoology and Genetics—M S , Ph D — Ecology and Evolutionary Biology,** Genetics ** Molecular Cellular and Developmental Biology ** Plant Physiology ** Toxicology ** Zoology

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*Areas of specialization are shown in the individual descriptions in the *Courses and Programs* section of this catalog and in the *Graduate College Handbook for Faculty and Students* Programs approved to offer majors may also offer declared minors

**Interdepartmental major

Interdepartmental Offerings and Cooperating Units

Interdepartmental Programs

Biomedical Engineering—College of Engineering College of Veterinary Medicine

Business Administration—College of Agriculture, College of Business

Business Administrative Sciences—College of Business Economics Statistics

General Graduate Studies—all departments offering graduate courses

Immunobiology—Agronomy Animal Science, Biochemistry and Biophysics Food Science and Human Nutrition Microbiology Immunology and Preventive Medicine Veterinary Pathology, Veterinary Physiology and Pharmacology and Zoology and Genetics

Industrial Relations—Economics Management Political Science, Psychology Sociology

Neuroscience—Animal Science, Biochemistry and Biophysics Computer Science Mathematics Microbiology Immunology and Preventive Medicine Psychology Veterinary Anatomy Veterinary Clinical Sciences Veterinary Physiology and Pharmacology and Zoology and Genetics

Professional Agriculture—Agricultural and Biosystems Engineering Agronomy Animal Science Economics Horticulture

Interdepartmental Majors

Ecology and Evolutionary Biology—Agronomy Animal Ecology Botany Entomology, Forestry and Zoology and Genetics

Genetics—Agronomy Animal Science Biochemistry and Biophysics Botany Entomology Food Science and Human Nutrition Forestry Horticulture Microbiology Immunology and Preventive Medicine Plant Pathology Statistics and Zoology and Genetics

Molecular, Cellular, and Developmental Biology—Agronomy Animal Science Biochemistry and Biophysics Botany Food Science and Human Nutrition Microbiology Immunology and Preventive Medicine Plant Pathology Veterinary Anatomy Veterinary Physiology and Pharmacology and Zoology and Genetics

Plant Physiology—Agronomy Biochemistry and Biophysics Botany Forestry Horticulture, Plant Pathology and Zoology and Genetics

Transportation Planning—Civil and Construction Engineering Community and Regional Planning and Transportation and Logistics

Toxicology—Animal Ecology Animal Science Biochemistry and Biophysics Botany Chemistry Entomology Food Science and Human Nutrition Microbiology Immunology and Preventive Medicine Plant Pathology Veterinary Pathology Veterinary Physiology and Pharmacology Veterinary Anatomy and Zoology and Genetics

Water Resources—Agricultural and Biosystems Engineering Agronomy Animal Ecology Botany Civil and Construction Engineering Forestry Geological and Atmospheric Sciences and Horticulture

Interdepartmental Minors

Gerontology—Architecture, Biochemistry and Biophysics Economics Family and Consumer Science Education and Studies Food Science and Human Nutrition Health and Human Performance Human Development and Family Studies, Political Science Professional Studies in Education Psychology Sociology and Textiles and Clothing

Housing—Anthropology Architecture Art and Design Community and Regional Planning Economics Family and Consumer Education and Studies Human Development and Family Studies Landscape Architecture Political Science Professional Studies in Education Sociology and Textiles and Clothing

Linguistics—Anthropology Computer Science English Foreign Languages and Literatures Psychology and Speech Communication

Mineral Resources—Aerospace Engineering and Engineering Mechanics Agricultural and Biosystems Engineering Agronomy Anthropology Chemical Engineering Chemistry Civil and Construction Engineering Community and Regional Planning Economics Forestry Geological and Atmospheric Sciences Industrial and Manufacturing Systems Engineering Landscape Architecture Materials Science and Engineering Mechanical Engineering Physics and Astronomy Political Science and Sociology

Technology and Social Change—Aerospace Engineering and Engineering Mechanics Agricultural and Biosystems Engineering Agricultural Education and Studies Agronomy Animal Science Anthropology Architecture Chemical Engineering Chemistry Civil and Construction Engineering, Community and Regional Planning Computer Science Economics Electrical Engineering and Computer Engineering English Family and Consumer Sciences Education and Studies Food Science and Human Nutrition Geological and Atmospheric Sciences History Human Development and Family Studies Industrial Education and Technology Industrial and Manufacturing Systems Engineering Journalism and Mass Communication Management Materials Science and Engineering Mechanical Engineering Philosophy Physics Political Science Professional Studies in Education Sociology Speech Communication Textiles and Clothing and Transportation and Logistics

Courses and Programs

Information About Courses

Course Numbers

The courses in each department are numbered from 1 to 699 according to the following groups

1-99	Courses not carrying credit toward a degree
100-299	Courses primarily for freshman and sophomore students
300-499	Courses primarily for junior and senior students
500-599	Courses primarily for graduate students but open to qualified undergraduates
600-699	Courses for graduate students only

Credits and Contact Hours

The academic value of each course is stated in semester credits Each credit is normally earned by attending one (50-minute) hour of lecture or recitation per week for the entire semester or by attending a laboratory or studio period of two or three hours per week In addition undergraduate students typically will be expected to spend two hours in preparation outside of class for each lecture or recitation hour additional outside work may be required for laboratory or studio classes

Each course states the number of semester credits assigned to the course preceded in parentheses by the number of hours in class (contact hours) expected of the student The first of the two contact-hour numbers indicates the number of lecture or recitation class hours per week for the semester The second is the number of laboratory or studio hours required per week Laboratory and studio hours may include some time devoted to lectures and recitations

The term Cr arr means that the amount of credit is arranged in advance between the student and the instructor The credit to be earned depends on the amount of work expected of the student in accordance with the policy that some combination of teacher-student contact and outside work by the student involving at least three hours per week for the entire semester is required for each credit

The term Cr R ' means that the course is required in a certain curriculum or as cognate to one or more other courses It is also used for cooperative education courses and for some optional inspection trips, study tours and professional development courses for which numerical credit is not granted

Semester of Offering

Within each course description may be found one or more of the following letters F S SS indicating which term—fall spring summer session—of the academic year the course is offered ' Alt is the abbreviation for alternate The abbreviation Yr " is used to designate a sequence of two courses taught fall and spring respectively If there is sufficient demand courses may be offered more frequently than announced Insufficient demand or unforeseen staffing problems may result in the cancellation of announced offerings Students are advised to refer to the *Schedule of Classes* or consult with departments for up-to-date course schedule information

Course Prerequisite

A prerequisite indicates the specific academic background or general academic maturity considered necessary for the student to be ready to undertake the course Prerequisites are usually stated in terms of specific courses but equivalent preparation is usually acceptable An instructor may however direct a student whose background does not meet the stated prerequisite or its equivalent to drop the course Conversely an instructor may waive the prerequisite for a course for which he or she is responsible Thus permission of the instructor is understood to be an alternate to the stated prerequisites in all courses

Cross-listed Courses

A course may be listed with its complete description in one department and without its description in another department In both cases the department with which the course is cross-listed is noted in parentheses The department in which the full description appears is responsible for the course but credit for the course may also be obtained through the department in which it is cross-listed

Co-listed Courses

A course including its complete description may be listed in two or more departments with the department or departments co-listing the course being noted in parentheses in each case All departments in which the course is listed share responsibility for its offering and credit for it may be obtained through any of the departments in which it is listed

Dual-listed Courses

Dual-listed courses permit undergraduate and graduate students to be in the same class but to receive credit under two different course numbers Credit in the graduate course is not available to students who have received credit in the corresponding undergraduate course Both graduates and undergraduates receive the same amount of credit for the course but additional work is required of all graduate students taking the course under the graduate-level course number This extra work may take the form of additional reading, projects examinations or other assignments as determined by the instructor The instructor must be a member of the Graduate Faculty or a Graduate Lecturer Each dual-listed course is designated in the catalog and on the graduate student s program of study with the letters DL ' although the student s official transcript of credits both graduate and undergraduate does not identify dual-listed courses as such There is a limit to the number of dual-listed course credits that may be used to meet the requirement for an advanced degree (For information about procedures for requesting permission to offer dual-listed courses, faculty should consult the *Graduate Faculty Handbook*)

Priority Enrollment

High demand for courses in certain areas including engineering business administration and design has necessitated enrollment management for some courses in those areas When enrollment priority is established for a course first consideration is given to students whose curriculum/major explicitly requires the course After those needs are met priority is based on the classification of the student with those nearest graduation receiving first consideration The *Schedule of Classes* published semiannually contains current information as to the courses for which priority enrollment is in use

Special Course Fees

Courses for which special fees are assessed are designated in this course description section along with the specific type of fee charged Special fee categories include materials fees (which may include consumable materials or other laboratory fees) field trip fees developmental math fee and summer camp fees In some cases special course fee amounts vary from term to term Billing and collection of special fees are handled through the university s accounts receivable system

Additional information on summer camp fees and the developmental math fee may be found in the fees and expenses section on page 14

Designators

For a list of abbreviations designating departments and programs see page 50

Graduate Programs

Graduate Major

A major in the Graduate College is the area of academic professional concentration approved by the Board of Regents in which the student chooses to qualify for the award of a graduate degree

Graduate Area of Specialization

Areas of specialization are indicated in the graduate statements of some departments This is a subdivision of a major in which a strong graduate-level program is available When approved by the Graduate College such areas of specialization are shown parenthetically after the major on official records including transcripts and thesis/dissertation title pages

Interdepartmental Programs

Interdepartmental programs are available at both graduate and undergraduate levels An interdepartmental program is an administrative structure usually not functioning as a department ordinarily headed by a supervisory committee and offering a degree with major(s) in that subject area Interdepartmental programs have been officially approved and may offer courses

Accounting

Labh S Hira Chair of Department

Professors Elvik Hira

Emeritus Professors Brown Handy

Associate Professors Bouillon Doran Maydew, Murphy Norris, Swanson

Assistant Professors Curtis Jeffrey Kurtenbach Seaton

Instructors Duffy Mazzitelli

Undergraduate Study

For undergraduate curriculum in business major in accounting see *College of Business Curricula*

The primary purpose of accounting is to provide relevant information to both internal users (management) and external users such as investors creditors government and the general public Accounting is an integral part of the management of business and public organizations Accountants therefore, participate in planning evaluating and controlling the activities of the firm Accounting is needed by external users in order to make investment decisions grant or withhold credit and in the case of government to collect revenue and gather statistical information In order to provide useful information accountants collect analyze, synthesize, and report data in an understandable manner

The major in accounting is designed to give students a conceptual foundation as well as to provide a wide range of basic skills and analytical tools for use in reporting for both public and private concerns Students who complete the accounting major are well prepared to accept positions in industry government, and the public accounting profession Completion of this program meets the current educational requirements for taking the CPA examination as established by the Iowa Accountancy Examining Board

The requirements for the accounting major are met by successful completion of the following courses Acct 284 285 383 385 386 387 496 and 497 plus one from Acct 388 486 487, 498 and 499

In addition it is highly recommended that an accounting major include Business Law (Acct 316) The Department of Accounting should be consulted for information on specific alternative plans of study

Graduate Study

The department participates in two graduate degree programs the M S in business administrative sciences and the M B A full-time day and part-time weekend programs The M S degree in business administrative sciences is a 30-credit curriculum culminating in a thesis The M B A programs are 48-credit nonthesis noncreative component curricula in which the first 24 credits are designed to be completed in a lock-step fashion

Open to graduate students for minor credit only 486 487 496 497 498 499

Courses Primarily for Undergraduate Students

215 Legal Environment of Business (3 0) Cr 3 F S SS *Prereq Sophomore classification* General history structure and principles of law Our legal system as an agency of social control good business technique and practice The court system administrative agencies contracts and agency law

284 Financial Accounting (3 0) Cr 3 F S SS Introduction to the basic concepts and procedures of financial accounting The accounting cycle business terminology basic control procedures and the preparation and evaluation of financial reports with emphasis on corporations

285 Managerial Accounting (3-0) Cr 3 F S SS *Prereq 284* The essentials of managerial accounting Methodology and uses of internal managerial reports in cost determination cost control pricing and long range planning

316 Business Law (3-0) Cr 3 F S *Prereq 215* Continuation of 215 Sales under the Uniform Commercial Code negotiable instruments secured transactions property transactions partnerships and wills and estates

383 Advanced Managerial Accounting (3 0) Cr 3 F S SS *Prereq 285* Advanced treatment of managerial accounting with emphasis on generation communication and use of information to assist management in performance of planning and control functions Topics include cost estimation allocation responsibility accounting complex variance analysis financial control systems in decentralized operations and decision models Field trips

385 Principles of Federal Income Tax (3-0) Cr 3 F S SS *Prereq 285* An overview of the fundamentals of income tax related to individual taxpayers and concepts applicable to all tax entities Transaction planning to maximize participation in preferential tax opportunities

386 Intermediate Accounting I (3-0) Cr 3 F S SS *Prereq 285* The conceptual framework of financial accounting Communication of financial information on the income and retained earnings statements statement of changes in financial position and the balance sheet Accounting concepts relating to current and operational assets of the firm

387 Intermediate Accounting II (3-0) Cr 3 F S SS *Prereq 386* Accounting theory and practice related to corporation formation and operation analysis of incomplete records liabilities pension costs leases price level adjustments application of concepts of present value current issues in financial accounting

388 Governmental and Non-profit Institution Accounting (3-0) Cr 3 F S *Prereq 285* Budgeting accounting auditing and financial reporting principles associated with private and public nonprofit organizations Includes survey of state local municipal and federal government accounting as well as accounting for colleges universities public schools hospitals and voluntary health and welfare organizations

486 Advanced Income Tax (3-0) Cr 3 F S *Prereq 385 386* Extended study of property transactions Principles of partnership and corporate taxation Tax planning Recommended for those who plan a career in public accounting

487 Accounting Information Systems (3-0) Cr 3 S *Prereq 386* Analysis of concepts and procedures underlying the automated accumulation and processing of accounting data EDP internal control and audit techniques Trends in accounting information systems Intended for the upper level accounting major Semester project is required

490 Independent Study Cr 1 to 3 each time taken *Prereq 285 senior classification permission of instructor*

496 Advanced Accounting Problems (3-0) Cr 3 F S SS *Prereq 387* Partnerships branch operations accounting for business combinations and affiliated companies consolidated financial statements reporting for multinational operation

497 Auditing I (3-0) Cr 3 F S SS *Prereq 387* The conceptual framework of auditing Rules of conduct External reporting concepts Audit methodology including procedures for gathering evidence Internal control audit verification and the role of statistical sampling in auditing for financial information systems

498 Accounting Theory and Contemporary Issues (3-0) Cr 3 S *Prereq 496 permission of instructor* To provide exposure to the theoretical constructs of accounting and current pronouncements of the FASB and other authoritative bodies Current theory and thought and topics not covered in other courses

499 Auditing II (3-0) Cr 3 S *Prereq 497* The application of auditing procedures in the review of the financial affairs of business The utilization of computerized system controls For students with a strong professional interest in auditing

Primarily for Graduate Students, major or minor, open to qualified undergraduates

580 Accounting Management (3-0) Cr 3 F *Prereq Graduate classification* Importance of accounting information in business decisions Management s use of planning and control concepts as they apply to all types and functions of organizations

581 Decision Models in Accounting (3-0) Cr 3 S *Prereq 383 or 580* Quantitative and decision making models such as cost estimation inventory evaluation and cost minimization techniques The focus of decision analysis specifically applied to accounting problems

585 Tax Implications of Business Decisions (3-0) Cr 3 S *Prereq 580 or 6 credits in accounting* The impact of federal tax legislation on the formation operation and liquidation or reorganization of entities Income and estate planning for executives

589 Accounting and Taxation of Agricultural Entities (3-0) Cr 3 F *Prereq 285 or 6 credits in accounting* Financial and cost accounting concepts and procedures for farming operations managerial decisions including present value analysis and break-even point analysis Procedures and planning of income and transfer tax as related to farming and ranching

590 Special Topics Cr 1 to 3 each time taken F S SS *Prereq Permission of instructor* For students wishing to do individual research in a particular area of accounting

Aerospace Engineering

(Administered by the Department of Aerospace Engineering and Engineering Mechanics)

David K Holger Chair of Department

Professors Akers Greer Holger C Hsu D Hsu Huston Inger Iversen Jischke McConnell McDaniel Munson Nariboli Pierson Rizzo Rogge Rudolphi, Schmerr Tannehill D Thompson R Thompson Tsai Wilson Young Zachary

Emeritus Professors Ohlsen, Riley Weiss

Associate Professors Hermann Hindman James Mitra Rajagopalan Roberts Rothmayer, Seversike Sturges Vogel

Assistant Professors Adams Allaei Budreck Dayal Flatau Gray Lu Mann Sherman

Instructors Todd Younger

Undergraduate Study

For undergraduate curriculum in aerospace engineering leading to the degree bachelor of science see *College of Engineering Curricula*

The aerospace engineer is primarily concerned with the design analysis testing, and overall operation of vehicles which operate in an atmosphere a fluid medium or outer space as well as on water and land surfaces The curriculum is designed to provide the student with an education in the fundamental principles of aerodynamics flight mechanics propulsion structural mechanics controls design testing and space technologies A wide variety of opportunities awaits the aerospace engineering graduate in research development design production sales and management in the aerospace industry and in many related industries in which fluid flow control and transportation problems play major roles

A cooperative education program in aerospace engineering is available in cooperation with several industries and government agencies The usual four-year curriculum is extended over a five-year span to permit alternate industrial experience periods and academic periods This arrangement offers valuable practical experience and financial assistance during the college years See *College of Engineering Cooperative Programs*

Graduate Study

The department offers work for the degrees master of engineering, master of science and doctor of philosophy with major in aerospace engineering and minor work to students taking major work in other departments For all graduate degrees it is possible to establish a co-major program with another graduate degree granting department Within the aerospace program work is available in the following areas computational aerodynamics optimization environmental aerodynamics control systems atmospheric and space flight mechanics structural analysis gas dynamics turbulence and aerospace systems design

The major work for the degrees master of science and doctor of philosophy requires an acceptable thesis in addition to the coursework For the degree master of engineering a creative component or suitable project as evidence of independent accomplishment is required Appropriate credit is allotted for this requirement

Minor work for aerospace engineering majors is usually selected from mathematics physics electrical engineering engineering mechanics mechanical engineering and meteorology

The normal prerequisite to major graduate work in aerospace engineering is the completion of a curriculum substantially equivalent to that required of aerospace engineering students at this university However because of the diversity of interests within the graduate programs in aerospace engineering a student whose prior undergraduate or graduate education has been in allied engineering and/or scientific fields may also qualify In such cases it may be necessary for the student to take additional work to provide the requisite background A prospective graduate student is urged to specify the degree program and the specific field(s) of interest on the application for admission

Courses normally will be offered at the times stated in the course description Where no specific time of offering is stated the course may be offered during any semester provided there is sufficient demand

The department also participates in the interdepartmental minor in technology and social change (See *Index*)

Open to graduate students for minor credit only 321 341 342 351 355 361 411 412 421 422 431 432 441 442 446 451 455 461 462 464

Courses Primarily for Undergraduate Students

110 Aerospace Engineering Curriculum Planning (1 0) Cr R F S Curriculum planning for pre aerospace engineering students in enrollment management categories I II and III

215 Numerical Methods and FORTRAN Programming (Com S 215 Math 215) (2 2) Cr 3 F S *Prereq Math 166 or 176 Engr 160 or Com S 207 or 227* Computer solutions to numerical engineering problems using advanced features of FORTRAN language Roots of single nonlinear equations simultaneous linear equations least square curve fitting numerical integration numerical solutions of ordinary differential equations Development of algorithms program efficiency use of debuggers

241, 242 Aerodynamics I II (3-0) Cr 3 each F S *Prereq 241 Math 166 Phys 221 Engr 160 or proficiency in FORTRAN programming credit or enrollment in 215 242 241* Introduction to applied aerodynamics of wings bodies and aerospace vehicles Incompressible and compressible flow Performance of aerospace vehicles

271 Aerospace Laboratory I (0-3) Cr 1 F S *Prereq Credit or enrollment in 242* Practical application of aerospace principles and concepts through laboratory studies and experiments Laboratory report writing

298 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

301 Flight Experience Cr R F S SS *Prereq Credit or enrollment in 242* Two hours of in flight training and necessary ground instruction Instruction provided by University Flight Services course content prescribed by the Aerospace Engineering and Engineering Mechanics Department Four hours of flight training certified in a pilot log book can be considered by the course instructor as evidence of satisfactory performance in the course Materials fee

321 Flight Structures Analysis (3-0) Cr 3 F S *Prereq E M 324* Determination of flight loads Materials selection for flight applications Analysis of flight structures including trusses beams and frames employing classical and finite element methods

321L Structures Laboratory I (0-3) Cr 1 F S *Prereq 271 credit or enrollment in 321* Laboratory to accompany 321

340 Introduction to Aerodynamics and Space Flight (3-0) Cr 3 F S **Prereq Math 265 Phys 221** Aerodynamics of flight vehicles Dynamics of space flight For nonaerospace engineering students

341 Aerodynamic Theory I (3 0) Cr 3 F S *Prereq Math 266 or 267* Incompressible potential flow Euler s equations thin airfoil and finite wing theory

341L Aerodynamics Laboratory (0-3) Cr 1 F S *Prereq 271 credit or enrollment in 341* Laboratory to accompany 341

342 Aerodynamic Theory II (3 0) Cr 3 F S *Prereq 341 M E 330 or 331* Energy equation compressible flow shock and expansion waves linearized subsonic and supersonic flow transonic flow hypersonic flow

342L Gas Dynamics Laboratory (0-3) Cr 0 5 8 weeks F S *Prereq 271 credit or enrollment in 342* Laboratory to accompany 342

351 Astrodynamics I (3 0) Cr 3 F S *Prereq Math 265 E M 345* Introduction to astrodynamics two body motion coordinate systems launch vehicle trajectories and atmospheric entry trajectories Orbital transfer methods lunar and interplanetary trajectories

355 Flight Vehicle Stability and Control (3-0) Cr 3 F S *Prereq 242 Math 267 E M 345* Aircraft rigid body equations of motion Longitudinal and lateral directional static and dynamic aircraft stability and control Flight handling characteristics

361 Analytical Techniques for Aerospace Design (1-4) Cr 3 F S *Prereq 321 341 credit or enrollment in 355* Application of analysis to engineering synthesis methodologies

397 Engineering Internship Cr R F S *Prereq Permission of department chair* Professional work period one semester maximum per academic year

411 Aerospace Vehicle Propulsion I (3 0) Cr 3 F S *Prereq 342* Principles of turbojet turboprop and ramjet propulsion systems Aircraft/engine mission integration

412 Aerospace Vehicle Propulsion II (3-0) Cr 3 S *Prereq 411* Performance dynamics and control of turbo-engines Blade element theory applied to propellers axial flow compressors turbines and fans Engine core and jet noise Solid and liquid rocket engine theory construction and operation Nuclear and electrical propulsion

421 Advanced Flight Structures (3 0) Cr 3 F S *Prereq 321 Math 266 or 267* Analysis of indeterminate structures Analytical solution of finite element analysis of heat conduction in structures static deflection and stresses in membranes plane stress and plate structures Buckling analysis of beams frames and plate structures Introduction to the dynamics of truss-type structures

422 Advanced Aerospace Structural Analysis (3-0) Cr 3 S *Prereq 421* Static and dynamic analysis and design of aerospace structures Advanced composites aeroelastic phenomena and thermal effects

424 Structures Laboratory II (0 3) Cr 1 F S *Prereq Credit or enrollment in 421* Laboratory experience in the fabrication and testing of composite materials

431 Flight Control Systems I (3 0) Cr 3 F S *Prereq 355* Linear systems analysis using frequency response and root locus methods Aircraft automatic controls systems and stability augmentation

431L Controls Laboratory (0 3) Cr 1 F S *Prereq Credit or enrollment in 431* Application of control theory to aircraft control systems synthesis

432 Flight Control Systems II (3 0) Cr 3 S *Prereq 431* Aircraft inertial cross coupling stabilization Launch vehicle pitch control system design Control system design for flexible vehicles Active satellite attitude control State variable description of flight control systems Pole placement controller design Introduction to sampled data systems

441 Aerodynamic Theory III (3-0) Cr 3 F S *Prereq 342* Viscous flow theory Boundary layer Aerodynamic heating

442 V/STOL Aerodynamics and Performance (3 0) Cr 3 S *Prereq 341 355* Introduction to the aerodynamics performance stability control and critical maneuvering characteristics of aerospace vehicles such as V/STOL aircraft helicopters hovercraft and other short range transportation vehicles

446 Computational Fluid Dynamics (3 0) Cr 3 S *Prereq 342* Introduction to modern computational fluid dynamics Emphasis on applying techniques to solve problems Finite difference and finite volume methods applied with implicit explicit and iterative techniques Generalized geometry description with grid generation techniques used Factoring time splitting TVD schemes tri diagonal systems

451 Astrodynamics II (3-0) Cr 3 S *Prereq 351* Orbit determination and prediction methods Many body problem General and special perturbation methods as applied to satellite and spacecraft trajectories Introduction to universal variable methods

455 Flight Systems Testing (2 3) Cr 3 S *Prereq 355* Principles of flight testing Techniques of data acquisition and data analysis Planning a flight test program Conducting a flight test program Materials fee

461 Design and Analysis I (1 4) Cr 3 F S *Prereq 342 355 361 credit or enrollment in at least two of 411 421 431* Application of the principles and methods of analysis and synthesis in the solution of aerospace engineering design problems with emphasis on a structured design process Introduction to applications of computer aided design

462 Design and Analysis II (1 6) Cr 3 F S *Prereq 461* Preliminary design of aerospace vehicles Detail design of aerospace vehicle components Fundamental principles used in engineering development of aircraft missile and space systems

464 Spacecraft Systems (3 0) Cr 3 S *Prereq 351* Space environment spacecraft launch vehicle integration placement in orbit attitude control systems attitude sensing systems space communications space power thermal control structures and mechanisms scientific instruments

490 Independent Study Cr 1 to 6 Arr *Prereq Junior or senior classification approval of the department chair*

A Aero and/or Gas Dynamics
B Propulsion
C Aerospace Structures
D Flight Mechanics
E Spacecraft Systems
F Flight Control Systems
G Aeroelasticity
H Honors
I Design

491 Aerospace Seminar (1-0) Cr R F

492 Aerospace Seminar (1 0) Cr R S Preparation and presentation of a technical paper Each student will be required to prepare and present a paper at an approved technical meeting Each student must also make a preliminary presentation of his or her paper during the course

499 Senior Projects Cr 1 to 3 F S *Prereq 361* Development of aerospace principles and concepts through individual projects

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

514 Advanced Mechanics of Materials (EM 514) See *Engineering Mechanics*

521 Airframe Analysis (3-0) Cr 3 F *Prereq 421 or E M 425* Analysis of static stresses and deformation in continuous aircraft structures Various analytical and approximate methods of analysis of isotropic and anisotropic plates and shells

531 Automatic Control of Flight Vehicles (3 0) Cr 3 S *Prereq 431* Applications of classical and modern linear control theory to automatic control of flight vehicles Spacecraft attitude control Control of flexible vehicles Linear quadratic regulator and pole placement design applications

533 Thermodynamics of Compressible Flow II (M E 533) *See Mechanical Engineering*

541 Incompressible Flow Aerodynamics (3 0) Cr 3 F *Prereq 341 or M E 424* Kinematics of fluid flow Derivation of Navier Stokes Euler and potential flow equations Generalized curvilinear coordinates Two dimensional and three dimensional singularities complex variables force and moment on an arbitrary cylinder Joukowski transformation potential flow solutions

542 Compressible Flow Aerodynamics (3-0) Cr 3 S *Prereq 541* Compressible flow equations in curvilinear coordinates Shock equations for normal oblique and curved shocks Exact solutions for wedge and cone Hodograph plane and applications Coordinate independent full potential equations and applications Linear theory Prandtl Glauert similarity Affine transformations applied to subsonic and supersonic airfoils and wavy walls

543 Viscous Flow Aerodynamics (3 0) Cr 3 F *Prereq 542* Derivation of Navier Stokes equations Exact solutions of Navier Stokes equations Incompressible and compressible boundary layers Similarity solutions integral methods computational methods and general solution methods Transition and turbulent flow

544 Applied Wing Theory (3-0) Cr 3 F *Prereq Credit or enrollment in 541* Methods of estimating the aerodynamic characteristics of swept and unswept steady and oscillating wings in subsonic and supersonic flight

546 547 Computational Fluid Mechanics and Heat Transfer I II (M E 546 547) (3-0) Cr 3 each Yr *Prereq 546 credit or enrollment in 541 or E M 571 or M E 538 547 546 546* Introduction to finite difference methods used in modern engineering Solution of example problems in fluid mechanics and heat transfer 547 Application of computational methods to current problems in fluid mechanics and heat transfer

551 Space Flight Mechanics (3 0) Cr 3 F *Prereq 351* General equations of motion for rigid body flight vehicles Coordinate systems and time keeping Two-body motion orbit transfers Patched conic and multi conic interplanetary trajectories Restricted three body problem

552 Entry Dynamics (3 0) Cr 3 *Prereq 551* Atmospheric entry and entry dynamics of missiles and spacecraft Trajectory control Descent and landing Thermal protection considerations Entry vehicle attitude control

555 Atmospheric Flight Mechanics (3-0) Cr 3 *Prereq 355* Use of energy methods and optimization in the performance analysis of highly maneuverable aircraft and missiles Stability and control analysis of flight vehicles

556 Guidance and Navigation of Aerospace Vehicles (3 0) Cr 3 F *Prereq 431* Principles of guidance systems for space vehicles launch vehicles homing and ballistic missiles Midcourse guidance modes Aircraft navigation Mechanization by inertial and other means including strapped down and stable platform inertial systems Application of Kalman filtering to recursive navigation theory Celestial navigation procedures with redundant measurements

561 Modern Aerospace Design Methodology (2-2) Cr 3 S *Prereq 341 351 421 431 proficiency in FORTRAN programming* Principles and methodology of optimal and statistical design applied to aerospace structural fluid dynamic flight dynamic and control systems

565 Systems Engineering and Analysis (E E 565 I E 565) (3 0) Cr 3 F *Prereq Graduate classification in engineering* Introduction to organized multidisciplinary approach to designing and developing systems Concepts principles and practice of systems engineering as applied to large integrated avionics systems Life cycle costing scheduling risk management functional analysis conceptual and detail design test evaluation and production

566 Avionics Systems Engineering (E E 566) (3 0) Cr 3 S *Prereq 565* Avionics functions Applications of systems engineering principles to avionics Top-down design of avionics systems Automated design tools

569 Mechanics of Composite and Combined Materials (E M 569 M S E 569) See *Engineering Mechanics*

571 Environmental Aerodynamics (3 0) Cr 3 *Prereq 341* Survey of atmospheric turbulence turbulent diffusion and velocity profile within the atmospheric boundary layer with emphasis on modeling by means of the environmental wind tunnel

573 Random Signal Analysis and Kalman Filtering (E E 573 Math 573 M E 573) (3-0) Cr 3 F *Prereq 431 or E E 374 or M E 360 or 411 or Math 341 or 395* Elementary notions of probability Random processes Autocorrelation and spectral functions Estimation of spectrum from finite data Response of linear systems to random inputs Discrete and continuous Kalman filter theory and applications Smoothing and prediction Linearization of nonlinear dynamics

574 Optimal Control (E E 574 Math 574 M E 574) (3 0) Cr 3 *Prereq 577* The optimal control problem Variational approach Pontryagin s principle Hamilton Jacobi equation Dynamic programming Time optimal minimum fuel minimum energy control systems The regulator problem Structures and properties of optimal controls

576 Digital Feedback Control Systems (E E 576 Math 576 M E 576) (3-0) Cr 3 *Prereq 432 or E E 475 or M E 411 or 414 or Math 415 and Math 267 or 371* Sampled data discrete data and the z transform Design of digital control systems using transform methods root locus frequency response and direct design methods Design using state-space methods Controllability observability pole placement state estimators Digital filters in control systems Microcomputer implementation of digital filters Finite wordlength effects Linear quadratic optimal control in digital control systems Simulation of digital control systems

577 Modern Control Systems I (E E 577 Math 577 M E 577) (3-0) Cr 3 F *Prereq 431 or E E 374 or M E 414 or Math 415 and Math 307 or 371* State variable and input output descriptions of linear continuous time and discrete time systems Solution of linear dynamical equations Controllability and observability of linear dynamical systems Canonical descriptions of linear equations Irreducible realizations of rational transfer function matrices Canonical form dynamical equations State feedback State estimators Decoupling by state feedback Design of feedback systems Stability of linear dynamical systems

578 Modern Control Systems II (E E 578 Math 578 M E 578) (3 0) Cr 3 S *Prereq 577* Well-posedness of nonlinear control systems Approximate analysis methods Krylov-Boguliubov method Poincaré perturbation method and describing function method Lyapunov stability theory Absolute stability of feedback systems Input-output stability Large scale systems

590 Special Topics Cr 1 to 5
A Aero and/or Gas Dynamics
B Propulsion
C Aerospace Structures
D Flight Mechanics
E Spacecraft Systems
F Flight Control Systems
G Aeroelasticity
H Viscous Aerodynamics
I Design
J Hypersonics
K Computational Aerodynamics
L Optimization

599 Creative Component Cr 1 to 5

Courses for Graduate Students, major or minor

620 Seminar (1-0) Cr 1

621 Aerospace Structures Analysis (3 0) Cr 3 Alt S offered 1993 *Prereq 521 E M 514* Analysis of dynamic behavior of continuous aircraft structures Various analytical and approximate methods used to determine the transient and steady state response of aerospace structures Fluid structure interaction and flutter of aircraft structures

631 Modern Flight Control Systems (3-0) Cr 3 F *Prereq 578* Applications of modern control theory to flight control Controller design based on optimal control techniques Nonlinear system theory applications Typical aerospace control methods such as model following load alleviation and flutter suppression Recent advances in aerospace vehicle control

635 636 Optimization in Aerospace Engineering I II (3-0) Cr 3 each *Prereq 635 531 541 551 636 635* Applications of unconstrained and constrained parameter optimization dynamic programming and optimal control theory to problems in aerodynamics aerospace structures flight dynamics and control and aerospace design Special emphasis on numerical methods of optimization

641 Hypersonic Gas Dynamics (3-0) Cr 3 *Prereq 542* High Mach number flows Newtonian theory small disturbance theory constant density solutions thin shock layers blunt body problems hypersonic boundary layers and viscous interactions thermally and calorically imperfect gases vibrational relaxing and chemically reacting flows

643 Advanced Computational Fluid Dynamics (M E 643) (3-0) Cr 3 F *Prereq 547* TVD/TVB/TVM/ENO schemes geometric consistency on 3 D moving grids real gas considerations 3 D shock fitting time accurate algorithms for 3-D unsteady flows on moving grids turbulence modeling grid generation boundary conditions on bodies in dynamic motion or undergoing structural deformation Focus on code development

650 Fluid Mechanics Seminar (M E 650) (1-0) Cr 1 each time taken F *Prereq Permission of instructor* Special topics of current research interest to students and staff of departments concerned

651 Mechanics of Space Vehicles Maneuvers (3 0) Cr 3 *Prereq 551* Vehicle orbital transfers intercept and rendezvous problems spacecraft and satellite attitude control using active and passive methods and entry vehicle control

661 662 Perturbation Methods in Viscous Fluid Flow I II (3-0) Cr 3 each *Prereq 661 341 441 662 661* Singular perturbation methods matched asymptotic expansions thin airfoil theory 1st and 2nd order boundary layer theory optimal coordinates the finite flat plate triple-deck theory coordinate expansions global theories of first separation linearized problems free interactions and upstream influence large scale separation introduction to solvability conditions and eigensolutions engineering models

690 Advanced Topics Cr 1 to 5
A Aero and/or Gas Dynamics
B Propulsion
C Aerospace Structures
D Flight Mechanics
E Spacecraft Systems
F Flight Control Systems
G Aeroelasticity
H Viscous Aerodynamics
I Design
J Hypersonics
K Computational Aerodynamics

699 Research

Aviation Technology (AV T)

These courses are administered by the Department of Aerospace Engineering and Engineering Mechanics The courses are taught by professional pilots in the university s Flight Service

Courses Primarily for Undergraduate Students

250 Theory of Flight (3-0) Cr 3 F Aviation weather federal aviation regulations aircraft performance navigation and airspace utilization use of flight computer and plotter and medical factors for pilots Upon completion of the course students are expected to pass the Federal Aviation Administration Private Pilot Airplane Written Examination

255 Basic Flight Laboratory (0 3) Cr 1 *Prereq Credit or classification in 250 and permission of the chief flight instructor* Flight maneuvers and procedures necessary for solo flight operations 20 hours of flight time Lab fee approximately $1 125 Materials fee

257 Advanced Flight Laboratory (0 3) Cr 1 *Prereq 250 255 and permission of the chief flight instructor* Cross country flying using pilotage dead reckoning and radio navigation night flying 25 hours of flight time to meet the experience requirements for the private pilot certificate Materials fee approximately $1 350

260 Instrument Ground School Introduction (3 0) Cr 3 F *Prereq 250 or private pilot license* Federal Aviation Regulations as they apply to instrument flying Instrument navigation using dead reckoning very high frequency omnidirectional range VOR ADF and ILS radio aids Use of IFR and instrument approach plates Procurement and use of weather reports and forecasts

490 Independent Study Cr arr *Prereq Permission of department chair*

African American Studies

(Interdepartmental Undergraduate Program)

Program Committee M Sawyer G Tartakov Co- chairs B Beavers R Herrnstadt (emeritus) R Johnson F Moorer C Pope C Tartakov two graduate and two undergraduate students

Undergraduate Study

African American Studies a cross-disciplinary program in the College of Liberal Arts and Sciences offers an opportunity for students to explore analyze and experience various aspects of African American culture via the study of its history literature art and religion as well as relevant aspects of the social sciences African American Studies can equip students with the skills sensitivities and knowledge necessary to help them function more intelligently within a pluralistic society and can serve as a guide for better race relations

Students can elect African American Studies as a minor In addition students in the College of Liberal Arts and Sciences can use African American Studies as an interdisciplinary studies major Most of the courses will satisfy general education requirements in the College of Liberal Arts and Sciences and many of them can be used to fulfill a part of the human relations requirement for teacher certification (See *Index Professional Teacher Education Requirements*)

The minor in African American Studies requires a minimum of 15 credits including Af Am 201 The remaining credits must include courses in at least two departments (excluding Af Am 490) At least six credits must be at the 300 level or higher

Graduate Study

Open to graduate students for minor credit only 334 347 348 349 475

Courses Primarily for Undergraduate Students

201 Introduction to African American Studies (3 0) Cr 3 F S An interdisciplinary introduction to the study of African American culture Includes history the social sciences literature religion and the arts as well as conceptual frameworks for investigation and analysis of the African American experience

252 African American Theatre Production Styles (Thtre 252) See *Theatre*

311 Introduction to African History (Hist 311) See *History*

325 Peoples and Cultures of Africa (Anthr 325) See *Anthropology*

330 Ethnic and Race Relations (Soc 330) See *Sociology*

333 African American Ethnography (Anthr 333) See *Anthropology*

334 African American Religious Experience (Relig 334) See *Religious Studies*

347 Survey of African American Literature (Engl 347) See *English*

348 Contemporary African American Literature (Engl 348) See *English*

349 Selected Topics in Minority Literatures (Engl 349) See *English* Available only when offered as a course in African American literature

353 354 History of African Americans (Hist 353 354) See *History*

475 Seminar Issues in the Study of Religion (Relig 475) See *Religious Studies* Acceptable only when offered as a course appropriate to the African American experience

490 Independent Study Cr 1 to 3 each time taken maximum of 3 *Prereq 6 credits in African American Studies permission of instructor and of the chair of the African American Studies Program*

Agricultural Education and Studies

Richard Ira Carter Interim Head of Department

Professors Carter, Crawford Kahler Miller Williams

Emeritus Professors Gauger, Soults

Associate Professors Almquist Bogue Bruene Gamon, Goering Hougen Jones Kuiper Linstrom Mackey Martin Trede

Assistant Professors Honeyman Morris Polito Wishart

Instructor Oelkers

Undergraduate Study

For undergraduate curricula in agricultural education agricultural extension education agricultural studies and professional agriculture (off campus) leading to the degree bachelor of science see *College of Agriculture Curricula* For a list of courses in the agricultural studies winter certificate program see *College of Agriculture Curricula*

The department offers four curricula for students desiring to enter work in the agricultural field These curricula are agricultural education agricultural extension agricultural studies and professional *agriculture (off campus) The agricultural* education curriculum prepares persons for careers as agricultural education instructors and educational personnel for industry and governmental agencies The agricultural extension education curriculum prepares persons for careers in extension The agricultural studies curriculum prepares persons for careers in farming other types of production agriculture and agricultural industry The professional agriculture curriculum an off-campus program supervised by an interdepartmental faculty committee provides agricultural coursework to persons who choose to study away from the Ames campus Graduates of each curriculum accept positions in agricultural business industry agencies and farming

The department coordinates the agricultural studies winter program Students satisfactorily completing all three winters receive a certificate

The department offers a minor in agricultural education and studies which may be earned by completion of a minimum of 15 credits in agricultural education and studies courses with a minimum of two courses at the 400 level Courses that can be taken for a minor are 310 311 315 410 411, 412 or 418, 414 450 490 and 499

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with a major in agricultural education a specialization in agricultural extension education opportunities for emphasis in international agricultural education and minor work to students majoring in other curricula Candidates pursuing the master of science degree may do so by completing either a thesis or nonthesis program of study

Complete descriptions of these programs are available in the department The department cooperates with the departments of Family and Consumer Sciences Education and Studies Industrial Education and Technology and Professional Studies in Education to provide a master of education degree with an area of specialization in vocational education The department offers courses at the graduate level for persons who have an interest in improving their teaching skills in agriculture

The department cooperates with other departments in the College of Agriculture to offer work for a co-major master of science degree to prepare area school and *community college agriculture teachers*

The department is the administrative home for the interdepartmental graduate program in professional agriculture designed for off-campus students pursuing a master of agriculture degree, see *Off-Campus Credit Courses and Programs*

The department also cooperates in the international development studies option of the General Graduate Studies Program and the interdepartmental minor in technology and social change

Courses and workshops are offered both on and off campus for extension personnel agricultural education instructors and industry personnel

Courses open to students for minor graduate credit 410 411 412 414 415 418 450

Courses Primarily for Undergraduate Students

102 Agriculture Seminar (2 0) 8 weeks Cr 1 each time taken maximum of 3 credits Selected topics in agricultural science including new techniques and practices used in production agriculture Guest speakers For students in the Agricultural Studies Winter Program only

110 Orientation to Agricultural Educational and Studies (1 0) Cr R F Orientation to the agricultural education agricultural extension education and agricultural studies curricula Career opportunities in education extension industry and farming
A Agricultural Education
B Agricultural Studies
C General Agriculture

111 Orientation for Agricultural Excellence Scholars (1-0) Cr 1 each time taken maximum of 2 credits F *Prereq Enrollment as an agricultural excellence scholar* The roles of professionals in agriculture academic preparation for assuming the role of a professional in agriculture and meeting the demands of the scholar s curriculum

112 Agriculture Biotechnology Colloquium (1-0) Cr 1 S *Prereq Enrollment as an agricultural excellence scholar* The scientific basis of biological and social sciences in agriculture

211 Early Field Based Experience (1 0) Cr 1 each time taken maximum of 3 credits F S SS *Prereq 110* 5 days plus orientation and evaluation sessions Field experience in an agricultural setting Overview of the roles of professional educators in agriculture Includes five days of on site experience Site options are schools extension agencies and industry

215 Career Seminar (1 0) Cr 0 5 F *Prereq Sophomore classification* Career aptitude evaluation summer employment opportunities résumé development and interviewing techniques

290 Special Problems in Agricultural Education and Studies Cr 1 3 F S SS

310 Foundations of Public Agricultural Education Programs (2-0) Cr 2 F S Historical development of public agricultural education programs Philosophic premises program goals and objectives

311 Presentation and Sales Strategies for Agricultural Audiences (3-0) Cr 3 F S Utilizing instructional methods techniques and problem solving presentation and sales strategies with agricultural audiences

315 Leadership Programs in Agriculture (3-0) Cr 3 F S Principles and practices in planning developing conducting and evaluating leadership programs for agricultural groups

410 Planning Agricultural Education Programs (2-0) Cr 2 F *Prereq 310* Philosophy of vocational agricultural education planning course content FFA SAE adult and young farmer education and cooperative experience programs

411 Teaching in Agricultural Education Programs (2 2) Cr 3 F *Prereq 311* Instructional delivery selection of methods and teaching aids student evaluation class management and micro-teaching in agricultural education programs

412 Internship in Agricultural Education and Studies 2 to 16 weeks Cr 2 to 16 F S SS *Prereq Junior classification and permission of instructor* A supervised learning experience in an approved learning setting with application to educational agricultural and/or environmental practices and principles

414 Developing Extension Agriculture Natural Resource and 4 H Programs (2-0) Cr 2 F S *Prereq 211 and permission of instructor* Basic concepts in planning and conducting agricultural extension education programs for youth and adults

415 Senior Seminar in Agricultural Education and Studies (1-0) Cr 1 F S *Prereq Senior classification* Offered on a satisfactory fail basis only
A Agricultural Education
B Agricultural Studies

417 Supervised Teaching in Agricultural Education Programs 12 to 16 weeks Cr 12 to 16 F S *Prereq 411 and admission to teacher education program* Supervised teaching in public schools

418 Supervised Extension Experience 2 to 16 weeks Cr 2 to 16 F S SS *Prereq 211 junior classification and permission of instructor* Supervised professional experience in an approved county or area Cooperative Extension Service office

450 Farm Management and Operation (1-6) Cr 3 F S SS *Prereq Econ 330 junior classification microcomputer course recommended* Participation in the management and operation of a diversified Iowa farm The class is responsible for the plans records and decisions for buying and selling the farm s livestock crops and equipment Special speakers on current topics May be taken for credit 3 times at different times of the year Field trip fee

490 Independent Study in Agricultural Education and Studies Cr 1 to 3 F S SS *Prereq Junior or senior classification permission of instructor A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation*
A Philosophy Curriculum and Methods
B Leadership Evaluation and Administration
C Business Industry and Farming
D Extension and International Agriculture
E Computers and Instructional Technology
F Environmental Issues
H Honors

499 Undergraduate Research Cr arr F S SS *Prereq Permission of instructor adviser and departmental executive officer* Research experience in agricultural education and studies with application to selected problems

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Short Course in Agricultural Education Cr 1 to 3 F S SS *Prereq Permission of instructor* Specific problems issues and content areas in

agricultural education On and off campus on arranged basis Materials fee

511 Instructional and Organizational Problems of Beginning Professionals in Agriculture (0-4) Cr 1 to 2 F S *Prereq Permission of instructor* Problems in planning and conducting agricultural programs Materials fee

512 Agricultural Education in the Career Development Process (3 0) Cr 3 Alt S offered 1995 *Prereq 411 and permission of instructor* Components of the career development process Integrating agricultural education objectives program activities and new instructional areas into the career development process The guidance function of the agricultural teacher and extension worker

514 Organizing Agricultural Information for Professional and Scientific Meetings (1 2) Cr 2 F S *Prereq Graduate classification in agriculture* Concepts and practices in planning preparing and presenting materials used in professional meetings and scientific papers by agriculturalists Materials fee

520 Instructional Methods for Teaching in Agricultural Education (3-0) Cr 3 Alt F offered 1994 *Prereq 411* Learning theories innovations and advanced principles in teaching methods and materials Group techniques including decision making developing interest and understanding and student evaluation Individualized instructional techniques and evaluation of instruction

521 Leadership Development in Agricultural Education (3-0) Cr 3 Alt F offered 1994 *Prereq 315 and permission of instructor* Principles and practices of leadership development Organization implementation and evaluation of individual and group leadership development in agriculture and *group dynamics*

524 Program Development and Evaluation in Agricultural Extension Education (3 0) Cr 3 F 1993 SS 1994 *Prereq 414* Development of program objectives implementation strategies and evaluation procedures based on agricultural needs and educational opportunities in communities counties and extension areas Experiences in marketing extension programs

538 Adult and Post-Secondary Education in Agriculture (3-0) Cr 3 Alt F offered 1994 *Prereq 410 and permission of instructor* The adult and post secondary learner in production agriculture and agricultural occupations adult learning styles and principles use of advisory groups community resources problem solving techniques and learning strategies for formal and nonformal education

560 Role of Agricultural Education and Agricultural Extension in Technology Transfer (3-0) Cr 3 Alt F offered 1993 *Prereq Soc 415* Processes by which formal and informal agricultural education programs and agricultural extension influence introduction and acceptance of agricultural technology including strategies for technology transfer

561 Agricultural and Extension Education in Developing Countries (3-0) Cr 3 Alt S offered 1994 *Prereq Permission of instructor* Utilizing systematic approaches to identifying analyzing and solving problems in international agricultural education with emphasis on the impact of agricultural education formal and nonformal on development

590 Special Topics in Agricultural Education Cr 1 to 3 F S SS *Prereq 12 credits in agricultural education*
A Curriculum
B Methods
C Philosophy
D Evaluation
E Administration
F Leadership
G Guidance
I Computers and Instructional Technology
J Extension
K International Agriculture
L Program Planning

593 Workshop in Agricultural Education Cr 1 to 3 F S SS *Prereq 12 credits in agricultural education Materials fee*
A Curriculum
B Methods
C Evaluation
D Administration
E Leadership
F Extension
G Program Planning

599 Creative Component F S SS For nonthesis M S degree programs

Courses for Graduate Students, major or minor

604 Evaluation in Agricultural Education (3 0) Cr 3 Alt F offered 1994 *Prereq 410 or 524 and permission of instructor* Criteria and procedures for designing evaluations of programs in agricultural education Critique of evaluation theories Selection and construction of evaluation instruments Reporting of results and recommendations

610 Curriculum Development in Agricultural Education (3-0) Cr 3 Alt F offered 1993 *Prereq 410 and permission of instructor* Analysis of social individual and subject matter needs in agriculture and their impact on agricultural curricula Application of new concepts and educational theory to curriculum planning in agricultural education

615 Seminar in Agricultural Education (1-0) Cr 1 F S SS Offered on satisfactory fail basis only

617 Professional Development of Agricultural Educators (1 0) Cr 1 F *Prereq Permission of instructor* Analysis of the roles and activities of professionals in agricultural education and agricultural extension with emphasis on identifying and describing future personnel roles in higher education Offered on satisfactory fail basis only

620 Research Procedures in Agricultural Education (3-0) Cr 3 S *Prereq ResEv 550 552* Application of research methods to agricultural education research Identification of research priorities selection and development of research design and critique of research in agricultural education

625 Administration and Supervision of Agricultural Education Programs (3-0) Cr 3 Alt S offered 1995 *Prereq 521* Management principles and practices of planning organizing directing staffing and evaluating as applied to administration and supervision of programs in agricultural education

630 Philosophy and Policymaking in Agricultural Education (3 0) Cr 3 Alt S offered 1994 *Prereq 410 and permission of instructor* Basic philosophic premises in development of agricultural education programs at federal state and local levels Impact of legislation on state and local policymaking Role of state and local advisory groups in policymaking

699 Research

Agricultural Engineering

(Administered by the Department of Agricultural and Biosystems Engineering)

James R Gilley Head of Department

Professors Baker Bern Bundy Chu Deboer Erbach Gilley Hoffman Hurburgh Kanwar Mangold Marley Melvin Meyer Misra Smith Van Fossen

Emeritus Professors Beer Bockhop Buchele Hazen Hoerner Hull Johnson Lovely Morford Pedersen Roth

Associate Professors Anderson Bekkum Colvin Greiner

Assistant Professors Boyd Glanville Hoff Mickelson Schwab Tim Xie

Instructor McDermott

Undergraduate Study

For the undergraduate curriculum in agricultural engineering leading to the degree bachelor of science see *College of Engineering Curricula*

The curriculum in agricultural engineering trains men and women to integrate basic biological and physical sciences through application of engineering fundamentals to biological systems involved in production processing storage handling distribution and use of food and other biomaterials and managing related natural resources worldwide

Graduates find employment in diverse ag-related industries and government agencies and work in engineering design development testing research manufacturing consulting sales and service Professional engineering services are performed in the agricultural equipment industries building and environmental companies grain processing and handling firms soil and water resource agencies and biotechnology companies

Food industry employment is related to production of food products Food engineers design develop implement and evaluate food processing procedures and systems

The department has cooperative programs established for interested and qualified students The four-year curriculum is extended over a five-year period and interspersed with work periods at cooperating organizations This plan offers valuable practical experience and financial assistance during the years in college

The department offers an undergraduate curriculum in agricultural systems technology see *College of Agriculture Curricula* The agricultural systems technology courses are offered for students in the College of Agriculture

Graduate Study

The department offers work for the degrees master of science master of engineering and doctor of philosophy with major in agricultural engineering and minor work to students taking major work in other departments Within the major the student may specialize in soil and water resources agricultural power and machinery food and process engineering or agricultural structures and environment Minor work is also offered in agricultural systems technology for students in other graduate majors See *Agricultural Systems Technology*

Prerequisite to major graduate work is the completion of an undergraduate curriculum substantially equivalent to that required of agricultural engineering undergraduate students at this institution However because of the diversity of interests within the graduate programs in agricultural engineering a student may qualify for graduate study even though the undergraduate training has been in a discipline other than engineering Supporting work will be required depending on the student s background and area of interest with requirements defined by departmental guidelines

For the degree doctor of philosophy an enrichment component is required on the program of study (POS) This component encourages broadening of the student s knowledge in some important subject area apart from the major minor or other principal thrust area The enrichment component shall consist of 6 hours of coursework at Iowa State University approved by the POS committee These courses can be at any academic level but must be taken for a grade and must have some central focus Testouts are not allowed Courses in any language are acceptable

The department also participates in the interdepartmental minors in mineral resources technology and social change and the interdepartmental major in water resources (see *Index*)

Open to graduate students for minor graduate credit only 342 363 413 422 445 446 447 478 479

Courses Primarily for Undergraduate Students

110 Seminar (1-0) Cr R S The field of agricultural engineering its relation to the agricultural industry and to the engineering profession

213 Field and Machine Systems (2 2) Cr 3 F *Prereq Credit or enrollment in all courses in the Basic Program* Laboratory experiences in applied agricultural engineering surveying hydrology soil conservation solar radiation field machinery performance power transmission and application Field trip fee

214 Environmental Engineering for Grain and Animal Systems (2 2) Cr 3 S *Prereq Credit or enrollment in all courses in the Basic Program* Laboratory experiences in applied agricultural engineering psychrometrics environmental control for livestock and grain grain preservation and quality measurement Use of spreadsheets

298 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative students Students must register for these courses prior to commencing each work period

303 Computer Applications and Systems Modeling (3 2) Cr 4 F *Prereq Engr 160 credit or enrollment in Math 265* Computer aided solution of agricultural engineering problems by use of numerical techniques and mathematical models Systems analysis and optimization applicable to agricultural engineering

342 Agricultural Tractor Power (2 3) Cr 3 S *Prereq M E 330* Thermodynamic principles and construction of tractor engines Fuels combustion and lubrication Kinematics and dynamics of tractor power applications drawbar power take-off and traction mechanisms Field trip fee

363 Agri-Industrial Applications of Electric Power (2 2) Cr 3 F *Prereq Phys 222* Single phase and three phase circuits Electrical safety Lighting and wiring system design Electric motors and motor controls Programmable logic controllers Standby power systems

397 Engineering Internship Cr R F S *Prereq Permission of department* One semester maximum per academic year professional work period

401 Senior Seminar (1 0) Cr R F *Prereq Senior classification* Preparation and presentation of papers on agricultural engineering subjects Discussion of engineering ethics and professionalism

413 Practical Fluid Power Circuits (M E 413) (0 3) Cr 1 F *Prereq Credit or enrollment in 447 or M E 414* Properties of fluids Pump and motor efficiencies Analysis and assembly of fluid power systems and experimental investigation of appropriate control systems Application to hydrostatic transmissions

422 Natural Resource Conservation Engineering (2 3) Cr 3 *Prereq 213 E M 378 or Ch E 356* The planning and design of systems to conserve and utilize the natural resources in the agricultural environment Small watershed hydrology water movement and utilization in the soil plant atmosphere system agricultural water management best management practices for control of erosion and agricultural water quality

445 Agricultural Engineering Design I (1 0) Cr 1 F *Prereq Credit or enrollment in 479 EM 324* Identification of current design problems in agricultural engineering Development of alternate solutions using creativity and engineering analysis and synthesis techniques

446 Agricultural Engineering Design II (1 4) Cr 3 S *Prereq 303 445 479* Selection of promising solutions to design problems identified in 445 for development by design teams Presentation of designs through oral and written reports

447 Power and Control Hydraulics (2-0) Cr 2 F *Prereq Credit or enrollment in E M 378 or M E 335* Properties of hydraulic fluids Performance parameters of fixed and variable displacement pumps and motors Characteristics of control valves Analysis and design of hydraulic systems for power and control functions Field trip fee

478 Design of Agricultural Structures (1 2) Cr 2 F *Prereq E M 324* Uniform Building Code and ANSI Standard Analysis of wind snow dead and live loads Pressures from granular materials Design of light framed agricultural structures using cold formed steel Flexural and compression members connections corrugated sheets Applications in grain bins agricultural buildings and equipment

479 Computer aided Graphics for Structural and Mechanical Design (1 2) Cr 2 F *Prereq Engr 160 E M 324* Application of AutoCAD in the design process Use of static and dynamic programs to interface with AutoCAD in an integrated design package Organization of drawings for ease of filing retrieval and modification

490 Independent Study Cr 1 to 4
- B Biosystems Engineering
- F Food Engineering
- H Honors
- P Power and Machinery
- Q Structures and Environment
- R Process Engineering
- S Soil and Water
- U Waste Management

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

502 Simulation of Agricultural Systems (3 0) Cr 3 S *Prereq Engr 160 Stat 401* Model development and computer simulation of processes and systems in agriculture Model elements include soil crop animal and machine parameters Interdisciplinary applications

503 Controls and Instrumentation for Agricultural Systems (3-0) Cr 3 Alt S offered 1994 *Prereq Math 267 E E 441* Linear response of control systems using Laplace transforms and numerical techniques Use of LSAP CSMP ODEPACK and SIMPLOTTER Feedback controllers Sensors Use of operational amplifiers as controllers Root-locus diagrams Discrete time systems and the microcomputer as a controller Case studies from agricultural engineering

504 Instrumentation for Agricultural and Biosystems Engineering (2 2) Cr 3 F *Prereq 363 or Cpr E 280 or E E 441* Interfacing techniques for computer based data acquisition and control systems Basic interfacing components and the conversion process required from analog to digital signals Sensors and theory of operation for the environmental sciences

520 Agricultural Water Quality Engineering (3-0) Cr 3 Alt S offered 1994 *Prereq Chem 167 and C E 360 or Agron 577* Physical and chemical properties and processes that affect the transport and fate of chemicals that occur in crop and livestock production Methods of measurement of chemical concentrations and loadings on the environment Modeling of chemical movement and fate Methods of control of nonpoint pollution in agriculture

522 Drainage and Irrigation Engineering (2 3) Cr 3 Alt S offered 1995 *Prereq 422 or C E 372 Agron 154 or C E 360* Soil water plant relationship, theory of infiltration and evapotranspiration saturated and unsaturated flow through soils movement of chemicals in the vadose zone Design of surface and subsurface drainage systems design of surface sprinkler trickle and subsurface irrigation systems Management of irrigation systems in developing countries

523 Erosion and Sediment Transport (3 0) Cr 3 Alt F offered 1995 *Prereq 422 and Math 266 or C E 472* Erosion processes Initiation of motion and overland flow Erosion models Flow in alluvial channels and theory of transport Surface soil and channel stability Wind erosion

551 Food Engineering (3 0) Cr 3 Alt S offered 1994 *Prereq Ch E 357* Physical and chemical properties of foods Kinetics of chemical reactions in foods Application of momentum heat and mass transfer in food processing Analysis of selected unit operations used in food processing

569 Grain Processing and Handling (2 3) Cr 3 S *Prereq 214 303* Grain and oilseed properties quality measurement processing and end use value Simulation of drying Grain handling systems Field trip fee

571 Timber Design for Agricultural Structures (1 2) Cr 2 Alt S offered 1994 *Prereq 478* Design of timber beams columns and fasteners Plywood design Analysis of timber structures by diaphragm action and matrix analysis Post frame building design Design with composite materials

572 Design of Environmental Systems for Agricultural Structures (2 2) Cr 3 Alt S offered 1995 *Prereq 214 M E 330* Principles of animal environment Insulation ventilation air distribution heating and cooling equipment and controls Analysis of air quality Research instrumentation

590 Special Topics Cr 1 to 3
- P Power and Machinery
- Q Structures and Environment
- R Process Engineering
- S Soil and Water
- T Construction and Maintenance
- U Waste Management

598 Technical Paper for Master s Degree Arr Cr 1 F S SS A technical paper draft based on M S thesis or creative component is required of all master s students This paper must be in a form that satisfies the requirements of some specific journal and be reviewed and assigned a journal paper number by the Agriculture and Home Economics Experiment Station editor Offered on a satisfactory fail basis only

599 Creative Component Cr var

Courses for Graduate Students, major or minor

661 662 Seminar (1-0) Cr 1 each Yr Discussion of research problems methods procedures and reports

690 Advanced Topics Cr var

698 Technical Paper for a Doctoral Degree Arr Cr 1 F S SS A technical paper draft based on dissertation is required of all Ph D students This paper must be in a form that satisfies the requirements of some specific journal and be reviewed and assigned a journal paper number by the Agriculture and Home Economics Experiment Station editor Offered on a satisfactory fail basis only

699 Research
P Power and Machinery
Q Structures and Environment
R Process Engineering
S Soil and Water
U Waste Management

Agricultural Systems Technology

(Administered by the Department of Agricultural and Biosystems Engineering)

J R Gilley Professor in Charge

Undergraduate Study

The Department of Agricultural and Biosystems Engineering offers work for the degree bachelor of science with a major in agricultural systems technology (see *College of Agriculture Curricula*)

The agricultural systems technology curriculum prepares men and women for careers requiring integration and application of agricultural and biosystems engineering technology agricultural and biological sciences and business to manage human and natural resources and systems for producing processing and marketing food and other biomaterials worldwide Graduates find careers with agricultural machinery industries service organizations governmental service agencies farm builders grain feed seed fertilizer and chemical companies or in production agriculture

The Department of Agricultural and Biosystems Engineering offers a minor in agricultural systems technology which may be earned by completion of a minimum of 15 credits of agricultural systems technology courses with a maximum of 6 credits of 100- and 200-level courses and at least two credits in 400-level courses Students may select courses to provide an area of emphasis such as

1 Machine and energy management
2 Livestock systems technology
3 Soil and water resource management
4 Electrical systems
5 Grain operations

For undergraduate curriculum in agricultural systems technology leading to the degree of bachelor of science see *College of Agriculture Curricula*

Graduate Study

The Department of Agricultural and Biosystems Engineering offers courses for minor graduate credit in agricultural systems technology for students taking major work in other departments and cooperates in the interdepartmental program in professional agriculture A minor in agricultural systems technology is offered

Open to graduate students for minor credit only 420 425 430 434 435, 462 464 473 474 475 476 489 490

Courses Primarily for Undergraduate Students

110 Orientation in Agricultural Systems Technology (1-0) 8 weeks Cr R F Program in agricultural systems technology and career opportunities

158 Agricultural Technology Management (2-4) Cr 2 8 weeks S *For students in Winter Program in Agricultural Studies only* Management of agricultural systems including machinery and power units and soil and water resources Integration of microcomputer applications within each systems area Materials fee

160 Electric Power Applications in Agriculture (1 3) Cr 1 8 weeks S *For students in Winter Program in Agricultural Studies only* Basic electricity and safety Wiring farm buildings Motors

173 Confinement Systems for Livestock Production (2-0) Cr 1 8 weeks S *For students in Winter Program in Agricultural Studies only* Environmental systems for livestock Buildings and equipment for livestock production systems

181 Microcomputer Applications in Agriculture (2 2) Cr 3 F S Microcomputer technology with applications in agriculture Introduction to computer operation functions and operating systems Operation and application of word processors spreadsheets with graphic display databases program integration and telecommunications Specific agricultural applications including decision aid accounting and management programs

185 Microcomputers in Production Agriculture (1 2) Cr 1 8 weeks S *Prereq For students in Winter Program in Agricultural Studies only* Computer applications relating to production agriculture with emphasis on use of existing software and peripherals There will be no instruction in programming Software may include word processing spreadsheets and data bases

191 Principles of Agricultural Systems Technology (2-0) Cr 2 F *Prereq Freshman or sophomore classification only* Introduction to problem solving related to systems in agricultural power and machinery soil and water conservation structures and animal environment and electrical circuits

233 Energy in Agriculture (2 0) Cr 2 F *Prereq Sophomore classification* Basic energy laws definitions and units supply use and conservation of conventional fuels in crop and livestock operations and potential for use of alternative energy sources in agriculture

260 Using Electric Power (1 3) Cr 2 S *Prereq Freshman or sophomore classification only* Basic electricity and electrical safety Wiring basics for homes and farm buildings Electric controls and motors Fee for field trip

***273 Livestock Buildings and Equipment** (2-0) Cr 2 S Environmental considerations in livestock housing Modified environment for confinement livestock buildings Planning buildings and equipment for livestock production systems

281 Computer aided Graphics (1-2) Cr 2 F S *Prereq 181* Computer-aided graphics for agricultural systems using AutoCAD MacDraw and other software Computer-aided drawing and dimensioning of two- and three dimensional shapes Attributes interfacing with other software Freehand drawing scanning and electronic clip art graphics integrated with text and applied to production of articles pamphlets promotion booklets and sales materials

324 Soil and Water Conservation Management (2-0) Cr 2 F S *Prereq 3 credits in math* Introduction to engineering principles applied to the planning of erosion control systems water control structures drainage and irrigation systems and farm water resource development

326 Conservation Surveying and Design (0-3) Cr 1 F Prereq *Credit or enrollment in 324* Agricultural surveys for field area measurement and mapping Handbook design of drainage systems and farm water control structures Layout of conservation structures Fee for field trip

330 Farm Machinery and Power Management (2-3) Cr 3 S *Prereq 3 credits of math* Selection sizing and operational principles required in the use of agricultural field and farmstead machine systems Cost analysis and computer techniques applied to planning and management of agricultural machine systems Principles operation and application of power sources

335 Tractor Power (3 3) Cr 4 F *Prereq 3 credits in math* Theory and construction of tractor engines mechanical power trains and hydraulic systems Introduction to traction chassis mechanics and hydraulic power Materials fee

358 Small Power Equipment (1 2) Cr 2 F S Principles of operation adjustment maintenance and repair of small internal-combustion engines and associated equipment Materials fee

360 Electric Power for Agriculture (2 3) Cr 3 F *Prereq 3 credits in math* Basic electricity Lighting design electrical safety wiring 3 phase service controls and motors for agricultural applications Programmable controller applications Planning electrical systems Fee for field trip

362 Systems for Preservation of Grain Quality (2 3) Cr 3 S *Prereq 3 credits in math* Principles and management practices for grain preservation with emphasis on corn Grain quality evaluation Psychrometrics Grain drying and dry grain storage High moisture systems Grain handling system layout and cost analysis Fee for field trip

403 Senior Seminar (1-0) Cr R F *Prereq Senior classification* Development of professionalism Technical society involvement

420 Land Drainage and Irrigation (2 0) Cr 2 Off campus offered as demand warrants *Prereq 324 Agron 154* Technical economic and social aspects of the planning and management of farm field drainage and irrigation systems Application of theory from engineering soil science and plant science to the solution of real world problems Designed for master of agriculture program

425 Impacts of Agriculture on Water Quality (2-0) Cr 2 F *Prereq One of the following 324 Agron 154 340 364* Relationship between agriculture and water quality chemical use 1985 Food Security Act and 1990 Farm Bill water quality monitoring techniques animal waste and water quality nonpoint source pollution management systems to reduce chemical leaching to groundwater

430 Farm Machinery Principles and Mechanisms (2 3) Cr 3 Alt S *offered* 1995 *Prereq 330 335 Phys 111* Advanced principles of agricultural machine mechanisms and components Forces strength energy and motion in machinery and its components Introduction to electronic control and/or monitoring systems and their diagnostics

434 Farm Machine Mechanisms (2-0) Cr 2 Off campus offered as demand warrants *Prereq 3 credits in math* Principles of clutches universal joints and belt chain gear and hydraulic drives Analysis of linkages used in agricultural machinery Constraints and limitations for successful operation Designed for master of agriculture program

435 Agricultural Safety (1 3) Cr 2 F *Prereq 3 credits in math* Risk recognition hazard analysis and danger evaluation in the agricultural industry Epidemiological study of accidents Product reliability safe design and operation Materials fee

462 Post-Harvest Grain Technology (2 0) Cr 2 Off campus offered as demand warrants *Prereq 6 credits in agricultural or biological science 3 credits in math* Grain drying and high moisture preservation methods with emphasis on corn Psychrometrics

Fans and airflow Grain handling methods and system planning corn milling soybean processing Designed for master of agriculture program

464 Grain Process Operations (1-2) Cr 2 Alt S offered 1994 *Prereq 362 or 462* Grain quality measurement end use value analysis grain handling corn wet milling and dry milling oilseed processing and seed conditioning Field trip fee

***473 Environmental Systems for Animal Production** (3 0) Cr 3 F *Prereq 3 credits in math* Effects of environment on animal production Principles of environmental control Planning confinement systems for livestock functional economic and environmental considerations

474 Livestock Housing Systems (2 0) Cr 2 Off campus offered as demand warrants *Prereq 6 credits in agricultural or biological science* Properties of moist air effects of environment on animal performance principles of environmental control feed handling systems manure management alternatives and planning total systems Designed for master of agriculture program

475 Agricultural Water Supplies and Waste Management (2 0) Cr 2 Alt S offered 1994 *Prereq 6 credits in biological sciences 3 credits in math* Water requirements supplies and treatment for domestic and livestock production systems On site domestic sewage disposal systems Livestock waste properties collection transport storage and treatment Practical design criteria and procedures

476 Planning Farmstead Systems (1 2) Cr 2 Alt S offered 1995 *Prereq 273 or 473* Layout and organization of farmsteads Planning farm homes livestock production buildings structures for crop storage and machinery housing Plans construction materials and structural considerations for agricultural buildings Materials fee

477 Animal Environment (2 0) 8 weeks Cr 1 Alt S offered 1995 *Prereq Second or third year classification in veterinary medicine* Effects of environment on animals Properties of air-water vapor mixtures air-conditioning processes and insulation and ventilation requirements Environmental modifications for livestock buildings

490 Independent Study Cr 1 to 5 *Prereq Junior or senior classification permission of instructor A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation*
A Animal Environment/Air Quality
C Computer Operations
E Electrical/Electronics
G Grain Operations
H Honors
M Machine Systems
N Energy
S Soil and Water Resources
T Structures
W Waste Management

493 Workshop in Agricultural Systems Technology Cr 1 Offered as demand warrants *Prereq Permission of instructor*
A Animal Environment and Structures
B Waste Management
C Computer Operations
D Electricity and Electronics
E Metals Fabrication
F Grain Operations
G Safety and Human Factors
H Water Quality
I Erosion Control
J Tractor Power and Machine Systems

496 Agricultural Systems Analysis and Planning (1-2) Cr 2 *Prereq 10 credits in AST and senior classification in agriculture* Student teams prepare oral and written reports on term projects involving analysis and planning of systems for agriculture The team projects include critical evaluation problem solving cost analysis and use of computer decision aid and computer graphics to prepare plans

*Credit for only one course from each of the following sets may be applied toward graduation 160 and 260 173 273 and 473

Agronomy

Ronald P Cantrell Head of Department

Professors I Anderson Benson, Blackmer Burris Buxton Campbell Cantrell I Carlson, R Carlson Cruse Duvick Fehr Fenton, Frey George Green Hallauer Hatfield Hodges Horton Imsande Karlen Keeney Larson Loynachan Miller Mullen, Owen Palmer Pearce Peterson Schafer Shibles Swan Tabatabai Takle Taylor Troeh Voss Whigham Wilson Yarger

Emeritus Professors Amemiya M Anderson Atkins Black Bremner Duncan Hanway Kirkham Pesek Russell Schaller Scholtes Scott Shaw Shrader Skrdla Stritzel H Thompson L Thompson Webb Wedin Woolley

Associate Professors P Anderson Barnhart Bretting Cianzio Dekker Jaynes Kaspar Killorn Knapp Lamkey Lee Logsdon Moorman Olson Radke Roath Sandor Shoemaker M Thompson

Assistant Professors Hansen Hartzler Henning Laird Oberle Pollak Salvador Schnable Widrlechner Wright

Instructor Ziegler

Undergraduate Study

For undergraduate curriculum in agronomy see *College of Agriculture Curricula*

The Department of Agronomy provides a curriculum for students interested in crop science soil science and agricultural meteorology

Students selecting agronomy as a major will elect to take either a management and technology environmental science or a science option An agronomy major prepares students for employment in agricultural business and industry agricultural service organizations crop production and soil management environmental and natural resource management farm management, and governmental agencies Graduates pursue careers in the seed fertilizer and agricultural chemical industries as field agronomists crop and soil management specialists research technicians sales and marketing specialists and production managers State and federal agencies employ agronomists as extension specialists county extension directors environmental and natural resource specialists research associates soil surveyors soil conservationists and in regulatory agencies as plant food and grain inspectors Additional areas of work open to agronomists include integrated pest management land appraisal agricultural finance turfgrass management and the home lawn care industry

The department offers a minor in agronomy which may be earned by credit in Agron 114 154 and 9 credits or more in approved agronomy courses of which 6 credits must be in courses numbered 300 or above Students may choose to specialize in crop science soil science or agricultural meteorology or they may choose to develop a general agronomy minor with courses selected from two or more of these specialties A list of approved courses is available from an agronomy adviser or the Agronomy Teaching Office

Students interested in acquiring a strong basic science education in crop science soil science agricultural meteorology or biotechnology or who wish to prepare for graduate study should consult with their adviser

Graduate Study

The department offers the degrees master of science and doctor of philosophy with majors in agricultural meteorology, crop production and physiology with optional specializations in seed science and weed science plant breeding and soil science with specialization in soil chemistry soil fertility soil management soil microbiology and biochemistry soil morphology and genesis or soil physics Minor work is offered for students with majors in other departments An M S nonthesis option is available for students desiring a general degree program with additional coursework and a written creative component substituting for thesis research

The department also cooperates in the interdepartmental program in professional agriculture interdepartmental majors in ecology and evolutionary biology genetics MCDB (molecular cellular and developmental biology) plant physiology and water resources and interdepartmental minors in mineral resources and technology and social change

Prerequisite to major work in this department is completion of an undergraduate degree program with emphasis on agronomic biological and physical sciences The foreign language requirement if any for the Ph D degree is established on an individual basis by the program of study committee appointed to guide the work of the student

Open to graduate students for minor credit only 318 334 354 364 406 412 415 421 434 456 457 473 483 485 493

Courses Primarily for Undergraduate Students

104 Professional Work Experience Cr R F S SS Staff Practical work experience in agronomy See adviser for departmental requirements

105 Leadership Experience Cr R F S SS Staff A participatory experience in activities or completion of a course that enhances the development of leadership and group dynamic skills See adviser for departmental requirements

110 Orientation in Agronomy (1-0) Cr R F Staff Opportunities and requirements of the agronomy curriculum Opportunities and challenges of a career in agronomy

114 Principles of Crop Production (2 3 to 4 individualized study) Cr 3 F S Mullen Introductory principles of plant-soil-climate relationships in crop production

142 Crop and Soil Fundamentals (4 0) 8 weeks Cr 2 S Polito Larson For students in the Farm Operation Winter I Program only Basic concepts and principles

144 Soil and Crop Management (4-0) 8 weeks Cr 2 S *Prereq 142* Larson Polito For students in the Farm Operation Winter II Program only Integrating soil and crop fundamentals into profitable crop production systems

146 Grain Crop Management (3 2) 8 weeks Cr 2 S *Prereq 144* George For students in the Farm Operation Winter III Program only Application of crop production and management decisions to production of grain crops in the northcentral U S Lab topics emphasize growth and development of corn soybean and oat crops insect and weed identification and control and forage species identification

****154 Fundamentals of Soil Science** (2 2 to 4 individualized study) Cr 3 F S *Prereq Chem 163* Schafer Introduction to physical chemical and biological properties of soils their formation classification and distribution Use of soil survey and computer databank information in balancing agronomic economic and environmental concerns in soil management

****156 Soils for Urban Use** (2-3) Cr 3 S *Restricted to students outside the College of Agriculture* Loynachan Fundamental properties of soils and their application to urban use Design of a site plan for area development from soil survey information will be emphasized Field trip fee

206 Introduction to Meteorology (Mteor 206) (3 0) Cr 3 F S R Carlson or Yarger Basic concepts in meteorology including atmospheric measurements radiation stability precipitation winds fronts forecasting and severe weather Applied topics include global warming ozone depletion world climates weather safety and atmospheric optics

211 Seminar (1 0) Cr 1 F S *Prereq Sophomore classification* Staff Career planning résumé preparation interviewing and job opportunities in agronomy Presentations from various agronomy related disciplines

212 Grain and Forage Crops (3 2) Cr 4 F S *Prereq 114* George Production and management practices for corn soybean small grain and forage crops common to Midwest agriculture Laboratory topics emphasize crop management growth and development quality plant characteristics and pest management

220 Crop Quality Utilization and Evaluation (2 0) Cr 2 S *Prereq 114* Campbell Uses and processing of agronomic crops Factors affecting crop quality commercial grades and utilization One 1 day field trip required Field trip fee

241 World Food Issues Past and Present (T SC 241 U St 241) (2 0) Cr 2 F Salvador World food problems in context of historical development of agriculture in major cradles of civilization Emphasis on population trends and socioeconomic policies as means to understand the disparities between potential agricultural production and present energy and nutritional deficiencies in key areas of the developing world

306 Use of Weather Data in Agriculture (Mteor 306) (1-1) Cr 1 S *Prereq 206* R Carlson Concepts relating to instrumentation collection and analyses of weather data relative to crop production in the Midwest Weather parameters of primary importance are described by using computer application examples and laboratory exercises

317 Principles of Weed Science (P M 317 Pl HP 317) (2 2) Cr 3 F S *Prereq Biol 109 or 110 a course in chemistry* Pearce Principles and practices of modern weed management systems Identification biology and ecology of weeds competition of weeds with desirable plants herbicide use environmental considerations and different types of weed control practices

318 Principles of Crop Physiology (3-0) Cr 3 F S *Prereq Bot 310 or 320* Pearce or Salvador Basic principles concerning the growth development and production of crop communities in relation to their environment

330 Crop and Seed Identification Laboratory (0-4) Cr 2 S *Prereq 114* Staff Identification agronomic and binomial classification of crops weeds and diseases Analysis of crop seed samples for contaminants of weed and other crop seeds

331 Intercollegiate Crop Identification Seed Analysis and Grain Grading (0-6) Cr 2 F *Prereq 330 permission of instructor 220 recommended* Staff Intensive training in crop weed and disease identification seed analysis and grain grading for competition in intercollegiate crops contests Field trip fee

334 Forage Crop Management (2-0) Cr 2 S *Prereq 114* George Management of forage crop legume and grass species as related to climate soils and utilization for harvested hay/silage pasture soil conservation and wildlife Production and management concepts applied to yield quality stand persistence and use of forage species

338 Seed Science and Technology (Hort 338) (2-2) Cr 3 S *Prereq 114 or Hort 221 Biol 109 or 110* Knapp Seed production maturation dormancy vigor deterioration and related aspects of enhancement conditioning storage and quality evaluation Aspects of the seed industry and regulation of seed marketing Laboratory exercises include seed quality evaluation seed identification tests for seed borne organisms seed conditioning and visits to in state seed companies Field trip fee

340 Chemical Use in Crop Management (P M 340) (3-0) Cr 3 S *Prereq Course in organic chemistry or B B 221 recommended* Pearce Managerial physiological and ecological effects of chemicals applied to crops and soils Includes pesticides growth regulators and nitrification inhibitors Fertilizers will not be included Types of formulations proper application safety environmental aspects historical aspects and legal considerations will be covered

351 Turfgrass Establishment and Management (Hort 351) See *Horticulture*

351L Turfgrass Establishment and Management Laboratory (Hort 351L) See *Horticulture*

354 Soil Fertility (Pl HP 354) (3 0) Cr 3 F S *Prereq 154* Troeh or Loynachan Effects of soils on plant growth with emphasis on nutrient elements and tilth Chemical and biological soil properties related to plant nutrition Physical soil properties related to root growth

354L Soil Fertility Laboratory (Pl HP 354L) (0-3) Cr 1 F S *Prereq Credit or enrollment in 354* Staff Emphasizes methods of assessing soil fertility and related properties

364 Soil Resource Conservation (2 3) Cr 3 S *Prereq 154* Troeh Relation of soil properties and land morphology to erosion Principles and methods of conserving soil Preparation of a conservation plan Out-of town field trips Field trip fee

370 Soil Profile Description and Interpretation (0-3) Cr 1 Can be taken twice F S *Prereq 154 and permission of instructor* Sandor Description classification and interpretation of soil profiles in the field and laboratory Evaluation of soil information for various land uses

371 Intercollegiate Soil Judging (0-3) Cr 1 Can be taken twice F S *Prereq 154 and permission of instructor* Sandor Intensive training in soil profile description classification and interpretation for competition in intercollegiate soil judging contests

***404 (504DL) Global Climate Change** (Mteor 404 504) See *Geological and Atmospheric Sciences Meteorology*

406 Climate of the Continents (Mteor 406) (2 0) Cr 2 F *Prereq Agron/Mteor 206* R Carlson The major climate controls and how they affect the world climate Climate classification Combining controls and classification to explain the pattern of climates of the different continents and the world

411 Seminar (1-0) Cr 1 F S *Prereq Junior or senior classification in agronomy* Cantrell and staff The history organization and functioning of agronomy departments in a land-grant university setting and a study of technical crops soils and agricultural meteorology journals and others pertaining to agronomy as a profession Student interpretation writings presentations and discussions

412 Crop Management (2-0) Cr 2 F S *Prereq 212 junior or senior classification* Larson Problem solving approach to crop management Principles and practices of agronomic science are used in the discussion of management problems related to corn soybeans forage small grain sorghum and alternative crops

415 World Crops (3-0) Cr 3 F *Prereq 114* Whigham Origin characteristics adaptation production and products of economically important beverage cereal fiber oil pulse starch and sugar crops grown throughout the world

421 Introduction to Plant Breeding (3 0) Cr 3 F S *Prereq Gen 330* Campbell Basic principles used in genetic improvement of plants A review of genetics and reproduction as related to plant breeding Methods of breeding self-pollinated cross pollinated and asexually reproducing plants

434 Pasture and Grazing Management (2-0) Cr 2 Alt F offered 1993 *Prereq 334* Staff Principles of grazing management for various pasture types Practices used in U S and elsewhere in relation to intensive grazing systems under continuous or intermittent grazing and maintenance of sward productivity Management and utilization of supplemental hay silage and row crop residue in year around systems

437 Seeds Problems and Issues (Hort 437) (1 3) Cr 2 F *Prereq 338 recommended* Campbell Impact of environmental regulatory economic and management considerations on production handling and marketing of seed Integrated analysis of problems and issues in providing quality seed of agronomic and horticultural crops using case studies and other problem solving techniques Field trip fee

445 Issues in Sustainable Agriculture (Env S 445) (2 0) Cr 2 F Salvador Synopsis of development of modern agricultural practices and their effect on biological and social environments Agricultural science as a human activity contemporary agricultural issues from agroecological perspective

456 Soil Fertilizer and Water Management (3 2) Cr 4 F *Prereq 354 114 recommended* Troeh Polito Schafer Integration of crop tillage drainage irrigation erosion fertility and fertilizer information in management decisions Economic and environmental implications of these decisions on long term sustainability Suitability and accuracy of soil evaluation methods Handling characteristics and soil reactions of organic and mineral fertilizers Materials fee

457 Soil Chemistry (2-0) Cr 2 Alt S offered 1994 *Prereq 354* Troeh Chemical and mineralogical properties of soils A study of the colloidal system based on the elemental and mineralogical composition of soils

473 Soil Genesis and Survey (2 3) Cr 4 S *Prereq 154* Sandor Relationships between soil formation landscape and environment Soil description classification mapping and interpretation for land use Two weekend field trips Field trip fee

483 World Soil Resources (3 0) Cr 3 Alt S offered 1995 *Prereq Chem 163 (154 recommended)* Schafer Properties classification and geographical distribution of soils with emphasis on their suitability for food production

485 Soil Biology (MIPM 485) (2 3) Cr 3 F *Prereq 154 MIPM 202 (MIPM 202L recommended)* Loynachan Description of organisms in the soil and plant environment and their role in organic matter decomposition (including natural materials chemicals and wastes) nitrogen fixation and transformations and other processes

490 Independent Study Cr 1 to 3 each time taken 4 cr maximum allowed toward the total of 128 credits required for graduation F S SS *Prereq Junior or senior classification with at least 8 credits in agronomy permission of instructor in specialty area after consultation* Selected studies in crops soils or agricultural meteorology according to the needs and interests of the student
H Honors

491 Seed Science Experience Cr 2 to 4 F S SS *Prereq 338 advance approval and participation of employer and instructor* Knapp Mullen A

professional work experience with a creative project in seed science The project requires the prior approval and participation of the employer and instructor and a written report For seed science majors

493 Workshop in Agronomy Cr arr 4 cr maximum allowed toward the total of 128 credits required for graduation *Prereq Permission of instructor* Staff Workshop experience in crops soils or agricultural meteorology

495 Agricultural Travel Course Preparation (0 1) Cr R F S *Prereq Permission of instructor Limited enrollment Students enrolled in this course also register for An S 495 and intend to register in Agron 496 and An S 496 the following term* Topics will include the agricultural industries climate crops culture economics geography history livestock marketing soils and preparation for travel to locations to be visited Information available 9 months before departure

496 Agricultural Travel Course Cr arr (approx half credit per week traveled each An S 496 and Agron 496) *Prereq Permission of instructor Limited enrollment* Field trip fee Students taking this course also register for An S 496 Tour and study of production methods in major crop and livestock regions of the world Influence of climate economics geography soils landscapes markets and other factors on livestock and crop production The location and duration of tours will vary The summer tour will visit a northern location and the winter tour will visit a southern location Information available 9 months before departure Tour expenses paid by students
A Summer Tour
B Winter Tour

499 Confronting Problems in Modern Agriculture (3-0) Cr 3 S Salvador *Prereq Senior classification* Introduction to soft systems analysis Integration of reductionist holist and humanist methods of inquiry to objectively confront modern agricultural problems Case studies and simulations Group project on actual problem

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*See page 119 for information on dual listed (DL) courses

**Credit for only 154 or 156 may be applied toward graduation not both

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Orientation Seminar (2-0) Cr 1 F *Prereq International agronomy graduate students only* Pesek and staff An introduction to Iowa and U S agriculture for international scholars in agronomic majors Field trips when possible Departmental role in the functioning of research teaching and extension in fulfilling the charge given the land-grant university Offered on a satisfactory fail basis only

***504 (404 DL) Global Climate Change** (Mteor 504 404) See *Geological and Atmospheric Sciences Meteorology*

505 Biometeorology (Mteor 505) (3-0) Cr 3 S *Prereq Agron/Mteor 206* Staff The heat exchange near the ground Radiation turbulence conductance and evaporation as components of the heat balance Temperature wind and humidity conditions in the microclimate Modification of the microclimate

508 Biophysical Crop Ecology (2 3) Cr 3 Alt F offered 1993 *Prereq 505* Taylor Principles of resource capture (light and water) applied to growth and development Ecological implications of radiation temperature moisture and the biological properties of size shape resistance to water vapor loss and absorptivity to solar and thermal radiation Physiological stress in the soil plant atmosphere continuum

516 Crop Physiology and Management (3-0) Cr 2 or 3 S *Prereq Bot 320* Shibles I Anderson Physiological and biochemical processes and their relationships to plant growth development and yield Application to crop culture and management Student may elect physiology only (10 weeks 2 cr) or the full topic (15 weeks 3 cr)

517 Weed Biology and Ecology (2-0) Cr 2 Alt S offered 1995 *Prereq 317 Bot 484* Dekker Physiological morphological ecological and sociological adaptations to disturbed agro-habitats resulting in weedy qualities in plants Genetic bases of colonizing species Crop-weed interactions Role of the environment in weed ecology

519 Herbicide Physiology and Biochemistry (2-0) Cr 2 Alt S offered 1994 *Prereq 317 Bot 310 or 320* Dekker Physiological biochemical and genetic bases of herbicide action in plants Herbicide modes of action bases of selectivity between plant species uptake and translocation of xenobiotics and fate of herbicides in the soil and environment

521 Principles of Cultivar Development (3 0) Cr 3 F *Prereq 421 Stat 401* Fehr Analysis of alternative breeding methods for improvement of crop plants Strategies for hybridization and self-pollination Sterility systems and their relationship to breeding methods and commercial hybrid seed production

522 Field Methods in Plant Breeding (0-6) Cr 2 SS *Prereq 521* Staff Field experience in planning and conducting plant breeding research for cross pollinated and self pollinated crops Offered on a satisfactory-fail basis only Field trip fee

523 Plant Genetic Resource Management (1-2) Cr 2 Alt F offered 1994 *Prereq Gen 330 permission of instructor* Staff Principles and practices of *in situ* and *ex situ* plant genetic resource management Contemporary approaches for plant genetic resource acquisition maintenance distribution characterization evaluation enhancement and utilization explored in lectures discussions and laboratory exercises

526 Field Plot Techniques in Plant Breeding (2-0) Cr 2 F *Prereq Stat 401* Hallauer Planning experiments for plant breeding research analysis of data and concepts in data interpretation

529 Cytogenetics in Plant Breeding (2 2) Cr 3 Alt F offered 1993 *Prereq 521 Gen 545* Peterson Chromosome recombination principles of chromosome pairing gene distribution within the genome aberrations polyploids genome relations aneuploids nullisomic analysis interspecific hybrids cell fusion evolution of the nucleotype repetitive DNA the eukaryotic genome and emergent techniques for the genetic improvement of crops Materials fee

533 Pasture Forage Research Methods (2-0) Cr 2 Alt F offered 1994 *Prereq 334 Stat 401* Staff Advanced concepts in production and quality evaluation of pastures and conserved forages Emphasis on research methods

538 Seed Physiology (2-0) Cr 2 Alt F offered 1994 *Prereq 338 B B 301 or Chem 331* Burris Physiological aspects of seed development maturation longevity dormancy and germination

541 Agricultural Meteorology (2-0) Cr 2 Off campus offered as demand warrants *Prereq 206* R Carlson Basic concepts in agricultural meteorology with emphasis on the weather agriculture relationship and the microclimate agriculture interaction Designed for the master of agriculture program

542 Advanced Crop Management (2-0) Cr 2 Off campus offered as demand warrants *Prereq 318 or 412* Staff Basic concepts in plant soil climate relationships with emphasis on recent advances in crop culture and management Designed for the master of agriculture program

543 Applied Plant Breeding (2-0) Cr 2 Off campus offered as demand warrants *Prereq Gen 330* Staff Techniques and principles involved in breeding and maintaining crop varieties Emphasis on the application of breeding methods to major field crops Designed for the master of agriculture program

544 Advanced Soil Management (2 0) Cr 2 Off campus offered as demand warrants *Prereq 354 or 456* Blackmer Cruse Basic concepts of soil management with emphasis on how various tillage and fertilization practices influence plant growth Designed for the master of agriculture program

545 Advanced Issues in Sustainable Agriculture (2 2) Cr 3 F Salvador *Prereq Two of 114 154 212 412 516 and permission of instructor* Synopsis of development of modern agricultural practices and their effect on biological and social environments Agricultural science as a human activity by examination of contemporary agricultural issues from agroecological perspective Individual study and group analysis of environmental literature and scientific reports

547 Weed Ecology and Control Strategies (2-0) Cr 2 Off campus offered as demand warrants *Prereq 317 318* Owen Weed evolutionary processes weed interference and propagule characteristics and development Biological attributes that enhance the ability of plants to persist as weeds Application of ecological principles to weed control strategies

551 Growth and Development of Perennial Grasses (Hort 551) See *Horticulture*

553 Soil-Plant Relationships (3-0) Cr 3 F *Prereq 354* Blackmer Composition and properties of soils in relation to the nutrition and growth of plants

554 Soil Environment-Root Relationships (2-0) Cr 2 Alt S offered 1994 *Prereq 354 Math 165 or 175* Cruse Implications of tillage practices on the soil environment and root activity Effect of soil physical properties on soil erosion

558 Laboratory Methods in Soil Chemistry (2-3) Cr 3 Alt F offered 1993 *Prereq 354 and Chem 210 or 211* Tabatabai Experimental and descriptive inorganic and organic analyses Operational theory and principles of applicable instruments including spectrophotometry atomic and molecular absorption and emission spectroscopy mass spectrometry X ray diffraction and fluorescence gas and ion chromatography and ion selective electrodes

575 Soil Morphology Genesis and Classification (3-0) Cr 2 or 3 Alt F offered 1994 *Prereq 457 473 Geol 100* M Thompson Synthesis of how landscapes water organisms and chemical reactions determine soil morphology and diagnostic horizons Two credit students will attend the first two thirds of the semester

577 Soil Physics (3 0) Cr 3 S *Prereq 354 Math 166 recommended* Horton The physical soil system the soil components and their physical interactions transport processes involving water air and heat

578 Laboratory Methods in Soil Physics (0 3) Cr 1 S *Prereq 577 concurrent* Horton Methods of measuring soil physical properties such as texture density and water content and transport of heat water and gases

585 Soil Microbiology and Biochemistry (MIPM585) (2 0 or 2 3) Cr 2 or 3 S *Prereq 485 one course in biochemistry* Loynachan Ecological and environmental considerations of soil microorganisms organic matter enzymes carbon and other nutrient cycles Laboratory emphasizes creative component

590 Special Topics Cr arr *Prereq 15 credits in agronomy* Literature reviews and conferences on selected topics in crops soils or agricultural meteorology according to needs and interest of student

593 Workshop in Agronomy Cr arr *Prereq Graduate classification*
A Crops
B Soils
C Agricultural Meteorology
D Microcomputers in Agronomy
E Seed Science
F Weed Science

599 Creative Component Cr arr *Prereq Nonthesis M S option only* A written report based on research library readings or topics related to the student s area of specialization and approved by the student s advisory committee
A Agricultural Meteorology
B Crop Production and Physiology
C Plant Breeding
D Soil Chemistry
E Soil Fertility
F Soil Management
G Soil Microbiology and Biochemistry
H Soil Morphology and Genesis
I Soil Physics
J Plant Physiology
K Seed Science
L Weed Science

Courses for Graduate Students, major or minor

600 Seminar (1 0) Cr 1 Reports and discussion of recent literature and research
A Plant Breeding F S Peterson or Hallauer
B Soils F S Staff
C Crop Production and Physiology F S Staff 600C offered on a satisfactory fail basis only

609 Agricultural Meteorology Conference (1-0) Cr 1 F S SS *Prereq Permission of instructor* Staff Literature reviews and conferences with instructor on special problems relating to agricultural meteorology beyond the scope of current courses offered

616 Advanced Topics in Crop Physiology and Biochemistry (4 0) Cr 4 Alt S offered 1994 *Prereq 516 Bot 511 513 B B 404 permission of instructor* I Anderson Shibles An in-depth treatment of physiological and biochemical processes and their relationships to crop growth and development Emphasis on individual study followed by in-class discussion

621 Advanced Plant Breeding (3-0) Cr 3 S *Prereq 521 Stat 436 or An S 550 Gen 545* Hallauer Estimation and interpretation of genetic effects analysis of mating designs heritability estimation intra and interpopulation selection methods inbreeding and heterosis classification and development of parental materials selection indices combining ability analysis procedures and *problems with germplasm evaluation*

625 Genetic Strategies in Plant Breeding (3 0) Cr 3 S *Prereq 521 Gen 545 Bot 545* Lee Evaluation of genetic molecular and cellular approaches to crop improvement gene transfer methods asexual hybridization and selection Application and role of basic plant biology in breeding programs and processes gene identification structure function regulation and modification Integration of molecular and cellular methods in breeding strategies analysis of alternative breeding methods regulatory and ethical issues

627 Cytogenetics and Advanced Plant Genetics (Gen 627) (3 0) Cr 3 Alt S offered 1995 *Prereq Gen 430 or 545* An analysis of chromosomes and their involvement in crossing over chromosomal aberrations polyploidy and plant evolution Gene regulation cytoplasmic inheritance and genetic control of meiosis in plants

629 Colloquium in Plant Breeding and Cytogenetics (1-0) Cr 1 Alt S offered 1994 *Prereq Gen 545 and permission of instructor* Peterson Presentation of papers and informal discussion of related literature in plant breeding and cytogenetics

655 Advanced Soil Fertility (2 0) Cr 2 Alt S offered 1995 *Prereq 553* Blackmer Evaluation of soil fertility and fertilizers theory and applications

657 Advanced Soil Chemistry (3-0) Cr 3 Alt F offered 1994 *Prereq 553 Chem 321* Staff Structural and surface chemistry of soil clay minerals

675 Advanced Soil Genesis and Classification (2 0) Cr 2 Alt S offered 1995 *Prereq 575* Fenton Processes reactions and theories in soil formation principles of soil classification

677 Advanced Soil Physics (2-0) Cr 2 Alt F offered 1994 *Prereq 577 Math 266 267 Com S 172 recommended* Horton The flow and distribution of water gas and heat in soils Physical principles and applications

685 Advanced Soil Biochemistry (MIPM 685) (2-0) Cr 2 Alt S offered 1994 *Prereq 585* Tabatabai Chemistry of soil organic matter and biochemical transformations brought about by microorganisms and enzymes in soils

696 Seminar in Plant Physiology and Molecular Biology (Bot 696) See *Botany*

698 Agronomy Teaching Practicum Cr 1 to 3 each time taken F S SS *Prereq Graduate classification in agronomy and permission of instructor* Staff Graduate student experience in the agronomy teaching program Offered on a satisfactory fail basis only

699 Research
A Agricultural Meteorology
B Crop Production and Physiology
C Plant Breeding
D Soil Chemistry
E Soil Fertility
F Soil Management
G Soil Microbiology and Biochemistry
H Soil Morphology and Genesis
I Soil Physics
J Plant Physiology
K Seed Science
L Weed Science

Air Force Aerospace Studies

John L Fraley Chair of Department

Professors Fraley

Assistant Professors Beaghan Slater Treu

Undergraduate Study

The objective of the Department of Air Force Aerospace Studies is to provide qualified students the opportunity to earn a commission as an officer in the active Air Force

The curriculum is divided into two basic phases the general military course (GMC) and the professional officer course (POC) The GMC is introductory and consists of four consecutive 1-hour courses normally taken during the freshman and sophomore years The GMC is not prerequisite to entry into the *POC although it is recommended by the* department

Prior to entry into the POC all students complete field training at an Air Force base Students who have completed the GMC participate in a 4-week program which provides a concentrated experience in the Air Force environment The training program includes junior officer training aircraft and aircrew orientation career orientation survival training an introduction to typical base functions and physical training A 6-week training program is provided for those students entering the POC who did not take the GMC This program includes all that is offered in the 4 week program plus the academic and leadership laboratory experiences included in the on-campus GMC courses

Selection for the professional officer course is on a competitive basis and cadets enrolling in this course must meet certain academic mental physical and moral standards Qualified cadets may be selected as flight candidates and receive flight instruction and screening during the summer prior to commissioning Upon enrollment in the POC all cadets are required to complete a contractual agreement with the Air Force which obligates them to 4 years of active duty as an officer in the United States Air Force if in a nonflying category and 8 years if a pilot or 6 years if a navigator Uniforms and AFROTC texts are supplied to the cadets and those in the POC receive a subsistence allowance of $100 per month

Entry into the program is not dependent on departmental major or year in the university A 2-year applicant must however spend 2 years as either an undergraduate or graduate student in an approved program in order to satisfy POC enrollment requirements A student who fails to observe the contract terms may be called to active duty in an enlisted grade

The best qualified cadets participate in a college scholarship program (CSP) that provides payment of full tuition fees and textbooks In addition the CSP cadet receives the $100 monthly subsistence allowance paid all cadets who have entered into the contractual agreement Upon acceptance of a scholarship the CSP student executes a contract with the Air Force Scholarships can be awarded for periods of 2 or 3 years To determine their eligibility and initiate application procedures for the scholarship program interested students should contact the department

All scholarship cadets must receive credit for or test out of a course in English composition and satisfactorily complete at least two academic terms of a major Indo-European or Asian language POC cadets must successfully complete a course in mathematical reasoning prior to commissioning *Additionally cadets are* encouraged to take a speech communication course

The AFROTC program is open to both male and female students Additional information concerning Air Force Officer Education may be obtained from the Professor of Aerospace Studies Iowa State University See also *Officer Education*

Courses Primarily for Undergraduate Students

***101 102 Leadership Laboratory I** (0 1) Cr R each Air Force customs and courtesies drill and ceremonies issuing military commands instructing directing and evaluating the preceding skills studying the environment of an Air Force officer and learning about areas of opportunity available to commissioned officers This laboratory is required if taking AFAS 141 142 and considering application in the POC

141 142 The United States Air Force Today (1 0) Cr 1 each Yr Development of the Air Force its functions and organization emphasis on functions of U S strategic offensive defensive and special purpose forces relationships and interaction with Army and Navy forces Review of speaking and writing skills Initial military training related to wearing the uniform engaging in military customs and courtesies and participating in military ceremonies

***201, 202 Leadership Laboratory II** (0-1) Cr R each Air Force customs and courtesies drill and ceremonies issuing military commands instructing directing and evaluating the preceding skills the

environment of an Air Force officer and learning about areas of opportunity available to commissioned officers Continued military training related to wearing the uniform engaging in military customs and courtesies and participating in military ceremonies This laboratory is required if taking AFAS 241 242 and applying for the POC

241, 242 The Development of Air Power (1-0) Cr 1 each Yr Development of air power from dirigibles and balloons through peaceful employment of U S air power in relief missions and civic action programs in the late 1960s the air war in Southeast Asia and the current posture of the Air Force Review of oral and written communicative skills

***301 302 Leadership Laboratory III** (0 1) Cr R each Advanced leadership experiences involving the planning and controlling of the military activities of the AFROTC cadet corps the preparation and presentation of briefings and other oral and written communications and the providing of interviews guidance and information that will increase the understanding motivation and performance of other cadets This lab is required if taking AFAS 341 342 and pursuing a commission

341 342 Air Force Management and Leadership (3-0) Cr 3 each Yr Communication skills management and leadership listening speaking and writing skills required by an Air Force officer management tools practices and controls management principles and functions leadership theory and practices Advanced leadership training pertaining to planning organizing supervising and conducting military activities through experiential exercises

***401 402 Leadership Laboratory IV** (0-2) Cr R each Advanced leadership experiences involving the planning and controlling of the military activities of the AFROTC cadet corps the preparation and presentation of briefings and other oral and written communications and the providing of interviews guidance and information that will increase the understanding motivation and performance of other cadets This lab is required if taking AFAS 441 442 and pursuing a commission

441 442 National Security Forces in Contemporary American Society (3-0) Cr 3 each Yr *Prereq 342* The military profession civil military interaction framework of defense policy formulation of defense strategy and management of conflict Formulation and implementation of U S defense policy Regional studies military law and in-depth Air Force doctrine and organization Advanced leadership training pertaining to planning organizing supervising and conducting military activities through experiential exercises

*Leadership Laboratory is open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the professor of aerospace studies

American Indian Studies

(Interdepartmental Undergraduate Program)

Program Committee Jerry Stubben Chair C Clark-Daniels D Gradwohl, K Mason M Pearson S Pett L Rogers J Weinkein L Whitbeck I White

The American Indian Studies Program is a cross-disciplinary program in the College of Liberal Arts and Sciences which offers an opportunity to learn more about the cultural heritage of American Indians their historical relationship with non-Indians and their participation in contemporary American society This program emphasizes perspectives from anthropology art history literature political science and sociology

The courses in the American Indian Studies Program provide added background for students whose career interests may include multicultural education human services programming legal services or public administration

Within the College of Liberal Arts and Sciences courses in American Indian studies can be used as electives in a minor or in an interdisciplinary studies major (for details see *Liberal Arts and Sciences Cross-Disciplinary Studies)* Students majoring in another college who wish to use these courses should consult their advisers

A minor in the College of Liberal Arts and Sciences must include at least 15 credits of courses in the field A minor in American Indian studies must also include 210 322 or 332 and at least two additional courses from a selected list of primary courses The American Indian Studies Program Committee will upon application by the student and review of the program certify that the student has completed a minor in American Indian studies

Courses Primarily for Undergraduate Students

210 Introduction to American Indian Studies (3 0) Cr 3 F S Introduction to the multidisciplinary aspects of American Indian studies Topics include literature the arts history anthropology sociology education and contemporary Indian politics Guest lectures media presentations and discussion of assigned readings

310 Topics in American Indian Studies (3-0) Cr 3 each time taken maximum of 6 S Issues within specific topical areas of American Indian society and culture such as social work with Indian families tribal government and environmental policy

490 Independent Study Cr var No more than 9 credits in Am In 490 may be counted toward graduation *Prereq 6 credits in American Indian studies permission of instructor* Designed to meet the needs of students who wish to study in areas other than those in which courses are offered

Primary Courses (Cross-listed)

322 The American Indian (Anthr 322) See *Anthropology*

323 Peoples and Cultures of Latin America (Anthr 323) See *Anthropology*

332 American Indians Today (Anthr 332) See *Anthropology*

346 American Indian Literature (Engl 346) See *English*

415 Archaeology of North America (Anthr 415) See *Anthropology*

520 Cultural Continuity and Change in the Prairie Plains (Anthr 520) See *Anthropology*

Primary Courses (Offered by Departments)

Hist 370 History of Iowa See *History*

Hist 465 The U S Westward Movement and Frontier Development See *History*

Pol S 312 Minicourse in American Government and Politics See *Political Science* Acceptable only when offered as a course in American Indian tribal government and political theory

Soc 330 Ethnic and Race Relations See *Sociology*

Soc 529 Minority Groups See *Sociology*

*Anthr 380 (580 DL) or Art 380 (580 DL) Ethnography of the Visual Arts See *Anthropology* or *Art and Design*

*Anthr 428 (528 DL) Archaeological Laboratory Methods and Techniques See *Anthropology*

*Anthr 429 (529 DL) Archaeological Field School See *Anthropology*

El Ed 280C Native American Tutoring (SecEd 280C) See *Elementary Education* or *Secondary Education*

*See page 119 for information on dual listed (DL) courses

Animal Ecology

Bruce W Menzel Chair of Department

Professors Atchison M Bachmann R Bachmann Best Clark, Dinsmore Franklin Klaas Menzel Summerfelt

Emeritus Professor Carlander

Assistant Professors Danielson Morris Pease

Undergraduate Study

The department offers work for the degree bachelor of science with majors in animal ecology and in fisheries and wildlife biology (*see College of Agriculture Curricula*)

The animal ecology curriculum provides its majors with an understanding of basic ecological principles and processes It is oriented toward students desiring a general and flexible program in environmental biology and for those planning graduate work in ecology An area of specialization must be selected from such areas as aquatic ecology, environmental problems nature interpretation pollution biology population ecology and terrestrial ecology Graduates find employment as ecologists for industry environmental consulting firms government agencies or as environmental protection administrators and as teachers after achieving teacher certification

The fisheries and wildlife biology curriculum includes study of vertebrate biology and ecology as a basis for research and management of wildlife resources An area of specialization must be selected See your academic adviser for guidance Special interests may be pursued through elective courses and summer employment Most employment opportunities in fisheries and wildlife biology are with government agencies Graduates are prepared for such positions as fisheries or wildlife biologist conservation officer park naturalist fish hatchery manager game farm technician or ecological survey technician

Both curricula require either three months of relevant work experience or study at a summer biological station prior to graduation The latter may be accomplished at the university s affiliate field stations Iowa Lakeside Laboratory at West Lake Okoboji Iowa and Gulf Coast Research Laboratory at Ocean Springs Mississippi Information on these laboratories is available from the department chair

The department participates in interdisciplinary programs in biology environmental studies and pest management By proper selection of free and restricted elective courses majors in animal ecology and fisheries and wildlife biology can obtain a minor or a secondary major in

environmental studies or pest management In addition students in either animal ecology or fisheries and wildlife biology are eligible for the College of Agriculture Scholarships for Excellence in Agriculture (see *Index*)

Preveterinary preparation may be achieved while satisfying degree requirements in either animal ecology or fisheries and wildlife biology

Additional education and training can lead to other opportunities in the fields of research and management natural resources planning and administration teaching and environmental consulting among others Graduate training is necessary for an increasing number of specialized positions within the fields of animal ecology and fisheries and wildlife biology Majors preparing for graduate study should consult with their academic advisers concerning appropriate coursework

Students seeking certification to teach biology in secondary schools must meet requirements of the College of Education as well as those of the Department of Animal Ecology In addition they must apply formally for admission to the teacher education program (see *Index Teacher Certification*) Students with an interest in careers in outdoor writing are encouraged to obtain a minor or a second major in journalism (See *Index Journalism and Mass Communication Courses and Programs*) The Department of Animal Ecology in cooperation with the Ding Darling Foundation provides scholarships to encourage students to communicate on environmental and conservation issues

The department offers a minor in fisheries and wildlife biology which may be earned by taking 15 credits in the department including 231 312 320 320L plus at least one course from 350 410 440 441 or 451 and at least one course from 321 322 323 or 324

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in animal ecology fisheries biology and wildlife biology Within these majors the student may also specialize in animal behavior aquaculture ecology or limnology Students may also major in interdepartmental graduate majors in ecology and evolutionary biology toxicology or water resources (see *Index*)

The Ph D degree requires proficiency in one foreign language This may be demonstrated by one year of college credit with a minimal average of 2 0 (on a 4 0 = A scale) by an Educational Testing Service Foreign Language Examination score of at least 500 or by committee approval of equivalent language experience The student s committee may require additional language competence

Personnel of the U S Fish and Wildlife Service through the Iowa Cooperative Fish and Wildlife Research Unit and the Iowa Department of Natural Resources contribute to the graduate programs of the department

No more than two dual-listed animal ecology courses may be applied for major graduate credit Additional work is expected of students taking a dual-listed course for credit at the 500 level

Open to graduate students for minor credit only 350 410 440 441 451

Courses Primarily for Undergraduate Students

104 Practical Work Experience Cr R Three months of relevant work experience or study at a summer biological station See adviser for specific requirements

110 Orientation in Animal Ecology (2 0) Cr R F Orientation to the majors of and career opportunities in animal ecology and fisheries and wildlife biology Offered on a satisfactory fail basis only

130 Wildlife and Agriculture (2 0) Cr 2 F S Survey of the ecology and management of fish and wildlife resources in areas of intensive agriculture with emphasis on Iowa Wildlife conservation and management practices for private agricultural lands Designed for nonmajors

201 Natural History Photography (0-2) Cr 1 F Application of photography for the study of nature landforms plants and wildlife Emphasis on techniques related to specialized problems of photography in natural environments

231 Introduction to Conservation Biology (3-0) Cr 3 S *Prereq Biol 109 or 201* Biological basis and principles for the conservation of natural populations and communities

300 Seminar (2 0) Cr 1 each time taken may be taken more than once for graduation credit F S *Prereq Permission of instructor* Current topics in animal ecology fisheries and wildlife biology and environmental issues

303 Internship Cr 1 to 3 F S SS *Prereq Permission of instructor and sophomore standing* Placement with county conservation boards camps zoos parks etc for experience as interpreters rangers and technicians

312 Ecology (Biol 312) See *Biology*

320 Vertebrate Biology (2 0) Cr 2 F *Prereq Credit or enrollment in Biol 202* Introduction to evolution and biology of vertebrates fish amphibians reptiles birds mammals

320L Vertebrate Biology Laboratory (0 3) Cr 1 F *Prereq Credit or classification in 320* Introduction to classification and identification of vertebrates fish amphibians reptiles birds mammals

***321 (521 DL) Ichthyology** (2-4) Cr 4 S *Prereq 320L* Biology classification and identification of major freshwater and marine fish groups Field trips

***322 (522 DL) Herpetology** (2 3) Cr 3 Alt S offered 1994 *Prereq 320L* Biology life histories classification and identification of amphibians and reptiles Field trips

***323 (523 DL) Mammalogy** (2-4) Cr 4 F *Prereq 320L* Ecology natural history identification and classification of mammals with emphasis on how mammals adapt to and interact with their environment Field trips

***324 (524 DL) Ornithology** (2 3) Cr 3 S *Prereq 320L* Ecology behavior and physiology of birds

325 Bird Study (0 3) Cr 1 S Classification and identification of birds emphasizing midwestern species Field trips

330 Interpretation of Natural Resources (2 3) Cr 3 S *Prereq 6 credits in life sciences* History objectives forms and techniques of natural resources interpretation in the settings of county state and national parks

331 Ecological Living (Env S 331) (1 3) Cr 2 Alt F offered 1994 An ecological approach to living on and in harmony with the land with emphasis on self reliant living Practical information on land ethics wildlife landscaping home food production fish ponds biological farming and alternative energy sources

341 Fish Farming (2-0) Cr 2 Alt S offered 1995 *Prereq One course in biological sciences* Techniques and principles related to rearing aquatic organisms for food bait and recreational fishery management

350 Wildlife Techniques and Habitat Analysis (0-4) Cr 2 S *Prereq 231 312 Stat 104* Techniques and methods used in research and management of wildlife with emphasis on inventory and manipulation of wildlife populations and habitat Field trips

410 Limnology (2-0) Cr 2 F *Prereq 10 credits in biological sciences Chem 163 or graduate classification* Structure and function of aquatic ecosystems with application to fishery and pollution problems

430 Media Techniques in Natural Resources Interpretation (3-0) Cr 3 Alt F offered 1994 *Prereq 330* Media techniques used by interpreters for teaching the public about natural resources Field trips

440 Fishery Management (3-0) Cr 3 F *Prereq 231 312 Stat 104* Biological basis of fishery management fishery problems and management practices for freshwater anadromous and marine fisheries

441 Fishery and Limnological Techniques (0 6) Cr 2 F *Prereq Credit or classification in 410 or 440* Field and laboratory methods used in fishery and limnological studies Field trips

451 Wildlife Management (2-3) Cr 3 F *Prereq 312 350 Stat 104* Basic principles of managing wildlife habitat and populations

490 Independent Study Cr arr F S SS *Prereq Junior or senior classification 10 credits in biological sciences and permission of instructor* Student initiated field laboratory or library project A total of 6 credits may be used toward degree requirements

493 Workshop (1 0) Cr 1 SS *Prereq Permission of instructor* Ecological concepts and fishery and wildlife management practices for landowners and farm managers Not for students majoring in animal ecology or fisheries and wildlife biology

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Seminar (2-0) Cr 1 each time taken may be taken more than once for graduation credit F S *Prereq Permission of instructor or graduate classification* Current topics in ecological research fish and wildlife management and environmental problems related to fish or wildlife resources

501 Field Seminar (0-3 or 0 6) Cr 1 or 2 each time taken *Prereq 231 and permission of instructor* Extended field trips to areas such as national parks and wilderness areas to study ecological topics in forests grasslands deserts wetlands or coastal and marine systems Field trip fee

510 Histology and Pathology of Fish Diseases (Zool 510) See *Zoology*

511 Population Ecology (3-0) Cr 3 Alt S offered 1995 *Prereq 312 Stat 401 a course in calculus* Theories and concepts of animal population dynamics with emphasis on models of growth predation competition and regulation

512 Behavioral Ecology (Zool 512) (3-0) Cr 3 Alt S offered 1995 *Prereq 312 Zool 304 recommended* Selected topics in behavior considered in relation to evolutionary and ecological concepts Includes predation foraging spacing reproduction and habitat selection

513 Pollution Ecology (3-0) Cr 3 Alt F offered 1993 *Prereq 312* Ecological relationships between aquatic and terrestrial organisms and environmental pollutants Aspects of source occurrence persistence toxicity ecosystem dynamics and rate of degradation of pollutants

515 Ecology of Freshwater Invertebrates (Zool 515) (1-6) Cr 3 Alt F offered 1993 *Prereq Biol 312 Zool 206 Stat 104* Identification natural history and ecological relationships of free living

aquatic metazoan invertebrates of the north-central region Emphasis on community structure and function and sampling techniques Field trips Field trip fee

516 Avian Ecology (3-0) Cr 3 Alt S offered 1994 *Prereq 312 324/524 permission of instructor* Current topics and theories including avian breeding and foraging ecology community structure habitat selection field methodologies and data interpretation Strong evolutionary emphasis

518 Stream Ecology (3-0) Cr 3 Alt S offered 1994 *Prereq 410* Biological chemical physical and geological processes that determine the structure and function of flowing water ecosystems Current ecological theories as well as applications to stream management for water quality and fisheries

520 Fish Ecology (3 0) Cr 3 Alt F offered 1993 *Prereq 312 321* Ecological interrelationships of fish communities in North American lakes and streams Emphasis on habitat and reproductive ecology and community structure

***521 (321 DL) Ichthyology** (2-4) Cr 4 S *Prereq 320L* Biology classification and identification of major freshwater and marine fish groups Field trips

***522 (322 DL) Herpetology** (2 3) Cr 3 Alt S offered 1994 *Prereq 320L* Biology life histories classification and identification of amphibians and reptiles Field trips

***523 (323 DL) Mammalogy** (2-4) Cr 4 F *Prereq 320L* Ecology natural history identification and classification of mammals with emphasis on how mammals adapt to and interact with their environment Field trips

***524 (324 DL) Ornithology** (2 3) Cr 3 S *Prereq 320L* Ecology behavior and physiology of birds

541 Aquaculture (2 3) Cr 3 Alt S offered 1994 *Prereq 341 or graduate classification* Concepts related to the intensive culture of aquatic organisms in flowing water systems including culture techniques nutrition and disease problems Field trip fee

543 Advanced Fishery Management (2 3) Cr 3 Alt F offered 1994 *Prereq 321 410 440 441* Survey and evaluation of principles and techniques used in research and management of fishery resources Field trip fee

544 Aquatic Toxicology (3-0) Cr 3 Alt F offered 1994 *Prereq 410 permission of instructor* Philosophy and science of establishing safe toxicant concentrations in aquatic ecosystems including aquatic chemistry and biological effects of toxic substances

550 Wildlife Energetics (3-0) Cr 3 Alt F offered 1993 *Prereq 451* Physiology nutrition and energetics of wild animals in relation to carrying capacity and habitat use

551 Wildlife Behavior and Management (2 2) Cr 3 Alt S offered 1994 *Prereq 312 a course in wildlife management recommended* Examination and synthesis of social organizational and behavioral concepts important for wildlife management Game and non hunted wildlife species of the world treated

580 Research Methods in Ecology (2 0) Cr 2 F *Prereq 20 credits in biological sciences and Stat 401* Research design proposal preparation technical writing and professional presentations

590 Special Topics Cr arr F S SS *Prereq Graduate classification permission of instructor A total of 6 credits may be used toward degree requirements*

593 Workshop in Animal Ecology Cr 1 to 3

Courses for Graduate Students, major or minor

600 Seminar (2-0) Cr 1 each time taken F S Current topics in ecological research fish and wildlife management and environmental problems related to fish or wildlife resources

611 Analysis of Populations (2 2) Cr 3 Alt S offered 1994 *Prereq 312 Stat 401 a course in calculus* Quantitative techniques for analyzing vertebrate population data to estimate parameters such as density and survival Emphasis on statistical inference and computing

614 Evolutionary Ecology Cr 3 Alt F offered 1995 *Prereq 312 Biol 303 a genetics course recommended* Relationships between animals and their environment with major emphasis on adaptive strategies and evolutionary mechanisms

699 Research

*See page 119 for regulations governing dual-listed (DL) courses

Courses Offered at the Iowa Lakeside Laboratory

Written permission of the instructor is prerequisite to all courses offered at the Iowa Lakeside Laboratory For current information concerning courses registration and housing see the annual *Iowa Lakeside Laboratory Bulletin* This bulletin is usually available from participating departments after February 15

301L (L 101) Field Natural History Cr 5 SS Biological diversity and its causes lectures and field trips to lake marsh forest and prairie habitats Measuring the environment sampling and identifying the organisms experimenting with the ecosystem understanding species interactions and appreciating influences of past and present climates and geological events on natural ecosystems of the region

326L (L 126) Field Ornithology Cr 5 SS *Prereq Junior/senior standing in biological science and permission of instructor* The biology ecology and behavior of birds with emphasis on field studies of local avifauna Group projects stress techniques of population analysis and methodology for population studies

419L (L 129) Vertebrate Ecology and Evolution (Zool 419) Cr 5 SS *Prereq 15 credits in zoology and ecology and permission of instructor* Field studies of representative northwest Iowa vertebrates Observation and experimentation emphasize ecological histories by integrating concepts of functional morphology behavioral ecology and evolutionary biology

508L 509L (L 103) Aquatic Ecology Cr 5 each SS Survey of local aquatic organisms and aquatic habitats analysis of physiographic physical and chemical factors Emphasis on field work methodology and basic ecological principles Field trips

520L (L 128) Fish Ecology Cr 5 SS *Prereq 320 and permission of instructor* Basic principles of fish interaction with the biotic and abiotic elements of the environment Field methods taxonomy and biology of fish with emphasis on the fauna of northwestern Iowa

Courses Offered at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi

Written permission of the coordinator for the Gulf Coast Research Laboratory 201 Bessey Hall Iowa State University Ames Iowa 50011 is prerequisite to all courses offered at the Gulf Coast Laboratory Numbers in parentheses beginning with MAR are GCRL numbers

347G (MAR 406) Fauna and Faunistic Ecology of Tidal Marshes Cr 1 SS *Prereq 16 hours of biological sciences and junior standing* Survey and discussion of the taxonomy distribution trophic relationships reproductive strategies and adaptation of tidal marsh animals with emphasis on those occurring in northern Gulf marshes

347LG (MAR 406L) Fauna and Faunistic Ecology of Tidal Marshes Lab Cr 3 SS Lab to accompany 347G

412G (MAR 405) Marine Ecology Cr 3 SS *Prereq 16 hours of biological sciences including general zoology general botany and invertebrate zoology* A consideration of the relationship of marine organisms to their environment including the effects of temperature salinity light nutrient concentration currents and food on their abundance and distribution

412LG (MAR 405L) Marine Ecology Lab Cr 2 SS Lab to accompany 412G

442G (MAR 410) Marine Fisheries Management Cr 2 SS A general course in fisheries management designed to acquaint students with the philosophy objectives problems and principles involved in management decisions Lectures will include specialists in biology fisheries statistics sanitation and marine law

442LG (MAR 410L) Marine Fisheries Manage ment Lab Cr 2 SS Lab to accompany 442G

443G (MAR 407) Marine Aquaculture Cr 3 SS *Prereq general zoology or invertebrate zoology* A lecture laboratory and field course designed to introduce aquatic and marine biology students to the history principles problems and procedures relating to the culture of commercially important crustaceans fish and mollusks along the Gulf Coast

443LG (MAR 407L) Marine Aquaculture Lab Cr 3 SS Lab to accompany 443G

Animal Science

Dennis Marple Head of Department

Professors Anderson Beitz Berger, Brackelsberg Brant Christian Ewan Ewing Ford Freeman Hoffman Holden, Horst Jurgens, Kenealy Kilmer Lamont Loy Marple Olson Owings Parrish Robson Rothschild Rouse Rust Sebranek Sell Spike Stahly Stevermer Strohbehn Stromer Topel Trenkle Willham Wunder Young Zimmerman

Emeritus Professors Arnold Foreman Haynes Jacobson Kiser McGilliard Nordskog Self Speer Voelker Warner Wickersham Zmolek

Associate Professors Huiatt Knipe Morrical Nissen Nonnecke Reinhardt Russell Skaar Timms Wilson

Assistant Professors Faust Kehrli Lindberg Miller-Graber Ramsey Tuggle Tyler vonBorell Youngs

Instructor Greiner

Undergraduate Study

For undergraduate curricula in animal science and dairy science see *College of Agriculture Curricula*

The department offers the degrees bachelor of science in animal science bachelor of science in dairy science and complementary work toward admission to schools of law medicine and veterinary medicine in either curriculum This may be done while satisfying requirements for the degree bachelor of science in animal science or dairy science (see *Index*)

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in animal breeding animal nutrition meat science muscle biology nutritional physiology physiology of reproduction and molecular cellular, and developmental biology Minor work is offered in these areas to students taking major work

in other departments For students desiring more general training the degree master of science is offered in animal production In this program additional coursework may be substituted for a thesis

A strong undergraduate program is required for those students interested in graduate study Fundamental training in biology chemistry mathematics and statistics is requisite to a satisfactory graduate program Graduate programs in animal science include supporting work in areas such as agronomy anatomy microbiology biochemistry chemistry economics food science and human nutrition genetics physics physiology and statistics Students may choose graduate programs involving a co-major with one of these areas Graduate work in meat science is offered as a co-major in animal science and food science and human nutrition

The department also cooperates in the interdepartmental program in professional agriculture and interdepartmental majors in genetics immunobiology MCDB (molecular cellular and developmental biology) and toxicology (See *Index*)

The foreign language requirement if any is established on an individual basis by the program-of-study committee appointed to guide the work of the student

Open to graduate students for minor credit only 318 319 331 352 353 360 413 414 415 416 420 423 425 426 429 434 436 470

Courses Primarily for Undergraduate Students

101 Animal Production (5-0) 8 weeks Cr 3 S *For Students in the Agricultural Studies Winter Program only* Farm animals in agriculture the application of production evaluation and marketing principles Includes live animal demonstrations with beef and dairy cattle horses poultry sheep and swine

102 Beef and Swine Feeding (3 2) 8 weeks Cr 2 S *For students in the Agricultural Studies Winter Program only* Feedstuffs Formulation of diets Feeding systems for beef and swine

110 Orientation in Animal Science (1 0) Cr R F Orientation to the university and Department of Animal Science

114 Survey of the Animal Industry (3 0) Cr 3 F S SS Issues impacting the U S and international animal industry Breeds basic management and marketing of farm animals Includes topics on beef and dairy cattle companion animals horses poultry sheep and swine and their products

115 Horsemanship and Equitation (0-2) Cr 1 F S Beginning and intermediate/advanced sections Can be taken a maximum of four times for credit English and Western equitation and horsemanship Field trip fee Lab fee

214 Basic Concepts of Animal Science (3-2) Cr 4 F S *Prereq 114 Biol 110 Chem 163 or 177* Basic elements of anatomy genetics growth and development nutrition physiology and reproduction of farm and companion animals Selection of breeding animals and evaluation of slaughter animals

215 Equine Selection (2 0) Cr 1 S second eight weeks *Prereq 214* Anatomy and selection techniques for various breeds Field trip fee Materials fee

218 Feeds and Feeding (3-0) Cr 3 F S *Prereq 114 Chem 163 or 177 For students not majoring in animal or dairy science* Nutritional principles digestive systems composition and nutritional characteristics of common feedstuffs ration formulation and recommended feeding programs for farm animals Credit for both 218 and 319 may not be applied toward graduation

224 Companion Animal Science (2-2) Cr 3 S *Prereq 214* Behavior nutrition breeding reproduction and management of companion animals

235 Dairy Cattle Performance (1-2) Cr 2 F *Prereq 101 or 114* Origin and development of breeds Improvement and expansion programs Comparison of types and performance Influences affecting commercial use and adaptability of types and breeds Marketing of dairy cattle and milk

270 Introductory Meats (2-2) Cr 3 F S *Prereq 114 Biol 201 Chem 177* Meat animal and carcass evaluation and utilization Slaughtering fabrication processing packaging preservation and sensory evaluation

285 Our Livestock Heritage (2-0) Cr 2 S A historic chronology of the influence of livestock on cultural evolution Comparative species heritage Contribution of livestock to the humanities

305 Livestock Evaluation (0-6) Cr 2 F *Prereq 214 junior classification* Beef cattle swine horses and sheep Field trip fee

316 Managing Equine Behavior (0-4) Cr 2 F Interaction of physiological development and behavior of the horse with training and athletic performance Educating the horse through bitting longeing and saddling Materials fee

318 Fundamentals of Nutrition (3 0) Cr 3 F S SS *Prereq Organic chemistry or B B 221 physiology recommended junior classification* Digestion and metabolism of carbohydrates fats proteins minerals and vitamins Measures of energy

319 Applied Animal Nutrition (2 2) Cr 3 F S SS *Prereq 318* Essential nutritive requirements of livestock and poultry sources and composition of nutrients replacement value of feeds in diets ingredient identification diet formulation and feeding recommendations Credit for both 218 and 319 may not be applied toward graduation

331 Animal Reproduction (3 0) Cr 3 F S *Prereq Course in physiology* Comparative anatomy physiology and endocrinology of animal reproduction Techniques for the control and manipulation of reproductive processes

332 Laboratory Methods in Animal Reproduction (0-4) Cr 2 F S *Prereq Credit or enrollment in 331* Comparative reproductive anatomy with emphasis on the physiology of normal reproductive function ways to control and improve reproduction principles of artificial insemination in farm animals and selected laboratory exercises with written report

335 Dairy Cattle Selection (0 6) Cr 2 S *Prereq Sophomore classification* Selection of breeding animals for dairy herds Comparative terminology decision making and presentation of oral reasons Trips to dairy cattle farms Livestock handling Field trip fee

352 Livestock Improvement Through Animal Breeding (3 2) Cr 4 F S SS *Prereq One course each in genetics and statistics* The genetic and environmental bases of animal differences Selection and mating systems as mechanisms for genetic change Emphasis on economically important traits Selection in a simulated breeding herd

353 Designing Breeding Programs for Livestock (0-4) Cr 2 S *Prereq 352* Evaluation of alternate breeding programs and molecular genetic techniques Multiple trait selection Merchandising seedstock Computerized simulation and management decision aids Field trip fee

360 Fresh Meats (2 2) Cr 3 F *Prereq 270 B B 221 or one course in organic chemistry* Carcass composition and grading Fundamentals of muscle contraction postmortem changes and fresh meat quality Wholesale and retail cuts merchandising tenderness cooking restructuring and patty production Field trip fee Materials fee

371 Meat for Food Service (1 2) Cr 2 S *Prereq FS HN 211 junior classification in hotel restaurant and institution management Open to non HRIM majors with instructor s permission* Meat and poultry for hotel restaurant and institutional use Structure composition cutting preparation selection sanitation portion control cooking and carving Materials fee

399 Animal Science Internship Cr 2 to 8 F S SS Practical experience related to animal science Creative component

410 Job Selection and Interviewing (1-0) Cr 0 F *Prereq Senior classification in animal or dairy science* Seminar course designed to inform students of the professional areas in animal sciences and other agribusiness industries in which they may find employment opportunities Résumé preparation and interviews

413 Equine Management Exercise Physiology (2 0) Cr 1 F first eight weeks *Prereq 6 credits in biology B B 221 or Chem 231 or 331* Techniques used to develop and assess conditioning and fitness in performance animals Field trip fee Materials fee

414 Equine Management Facilities Management (2-0) Cr 1 F second eight weeks *Prereq 214 Econ 201 Com S course* Modeling of facilities development and management equine management computer applications Field trip fee Materials fee

415 Equine Management Nutrition and Health Management (2 0) Cr 1 S first eight weeks *Prereq 218 or 319* Feeding for growth breeding and performance Health maintenance programs Field trip fee Materials fee

416 Equine Management Reproductive Management (2 2) Cr 2 S second eight weeks *Prereq 331 352* Current concepts of reproduction and breeding management Field trip fee Materials fee

420 Poultry Nutrition (2-2) Cr 3 S *Prereq 319 331* Theoretical and practical aspects of poultry nutrition Ration formulation mixing and feeding tests Feeding programs and requirements at different ages

423 Poultry Management (2 2) Cr 3 F *Prereq 319 331 352* Practical feeding and management of chicken and turkey flocks Operational study of commercial farms including production and marketing practices Field trip fee

425 Swine Management (2 2) Cr 3 F S *Prereq 319 331 352* Life cycle swine production Field trip fee

426 Beef Cattle Systems Analysis (3 2) Cr 4 F S *Prereq 270 319 331 352* Life cycle beef production Emphasis on cow calf production and feedlot management and the decision making processes involved in the interrelationships of breeding feeding and marketing Field trip fee

429 Sheep Management (3 2) Cr 4 F *Prereq 319 331 352* Calendarized farm flock program Programs for feeder lambs Field trip fee

434 Dairy Cattle Management (3 0) Cr 3 F S *Prereq 319 or 218 331* Facilities feeding management of the milking herd Nutritional relationships in milk secretion Raising herd replacements Field trip fee

436 Dairy Enterprise Planning (2-2) Cr 3 S *Prereq 434* Independent student and team development of dairy production systems cost analysis budgets and labor requirements Field trip fee

440 Computer Applications (2-0) Cr 2 F S *Prereq 270 331 319 352* Introduction to electronic spreadsheets database management computer communications and other approaches to problems in animal science Beginning elements of livestock systems analysis

451 Biotechnology in Animal Science (2 2) Cr 3 *Prereq 352 B B 221 or organic chemistry Biol 301 permission of instructor* Applications of

biotechnology to domestic animal production systems Introduction to basic physical properties of DNA restriction endonuclease mapping gene cloning DNA sequencing and amplification analysis of molecular genetic differences Materials fee

470 Processed Meats (2-2) Cr 3 S *Prereq 270 BB 221 or a course in organic chemistry* Physical chemical and biological characteristics of meat that influence composition formulation and quality of processed meat products Techniques ingredients and equipment used in cured meats fresh cooked dry and semi-dry sausages and liver and jellied products Field trip fee

475 Intercollegiate Judging Training and Competition A Cr 1 to 5 F S B Cr 1 to 5 F S C Cr 1 to 5 F S D Cr 2 S *Prereq Admission by invitation*
- A Meat Animals and Horses
- B Dairy Cattle
- C Meats
- D Meat Animal Evaluation Specialized training in evaluating and grading live animals and carcasses

490 Independent Study Cr 1 to 3 F S SS *Prereq Permission of the instructor A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation* Open to juniors and seniors in animal science and dairy science showing satisfactory preparation for problems chosen Individual topic conference and preparation of report Materials fee
- A Animal Science
- B Dairy Science
- C Meat Science
- D Senior Seminar
- G Poultry Science
- H Honors

493 Workshop in Animal Science Cr 1 to 3 Offered as demand warrants *Prereq Permission of instructor* Workshop in livestock production Includes current concepts in breeding nutrition reproduction meats and technologies that impact the animal industry

495 Agricultural Travel Course Preparation (0 1) Cr R F S *Prereq Permission of instructor* Limited enrollment Students enrolled in this course will also register for Agron 495 and intend to register in Agron 496 and An S 496 the following term Topics will include the agricultural industries climate crops culture history livestock marketing soils and preparations for travel in regions to be visited

496 Agricultural Travel Course Cr 1 to 3 *Prereq Agron 495 and An S 495 Permission of instructor 30 college credits* Limited enrollment Field trip fee Students taking this course will also register for Agron 496 Tour and study of production methods in major crop and livestock regions of the world Influence of climate culture customs economics geography soils landscapes markets and other factors on livestock and crop production Locations and duration of tours will vary between U S and international destinations Winter tour is taken between fall and spring terms Summer tour is taken during May and June following the end of spring term
- A Summer tour
- B Winter tour

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Computer Techniques for Biological Research (2 2) Cr 3 S *Prereq Stat 401* Development of computing strategies for problem solving Constructing algorithms in FORTRAN Organizing data and analyses using statistical program libraries Introduction to WYLBUR graphics and job control language

503 Seminar in Animal Production (1 0) Cr 1 F *Prereq Permission of instructor* Discussion and evaluation of current topics in animal production and management

505 Techniques in Animal Nutrition Experimentation (2-3) Cr 3 Alt S offered 1995 *Prereq Stat 401* Planning execution interpretation and communication of nutrition research

510 Applied Animal Breeding (2-0) Cr 2 Off campus offered as demand warrants *Prereq 352 Stat 493* Principles of animal breeding application to improvement of domestic animals Heritability genetic and phenotypic correlations selection index sire and dam evaluation and breeding program design Designed for master of agriculture program

511 Applied Ruminant Nutrition (2-0) Cr 2 Off campus offered as demand warrants *Prereq 319* Procedures and theories in beef dairy and sheep nutrition Feeding programs and requirements for lactation growth and reproduction Designed for master of agriculture program

512 Applied Non Ruminant Nutrition (2 0) Cr 2 Off campus offered as demand warrants *Prereq 319* Recent developments and application of basic nutritional concepts for swine and poultry production Selected aspects and concepts of computer diet formulation Designed for master of agriculture program

518 Advanced Non Ruminant Nutrition (3-0) Cr 3 F *Prereq 319* Digestion and metabolism of nutrients Nutritional requirements and current research and feeding programs for poultry and swine

519 Advanced Ruminant Nutrition (3 0) Cr 3 S *Prereq 319* Digestion absorption and metabolism of nutrients in the ruminant and preruminant Nutritional requirements and feeding programs for ruminant species

533 Physiology and Endocrinology of Animal Reproduction (2-0) Cr 2 Alt S offered 1995 *Prereq General physiology course* Development of structure and function of the reproductive system Physiologic and endocrine aspects including puberty gametogenesis estrous cycle pregnancy parturition interaction of environment thyroid and adrenal function and nutrition with these processes

540 Livestock Immunogenetics (Imbio 540) (2 0) Cr 2 Alt S offered 1995 *Prereq 550 or Gen 430 or MIPM 520* Basic concepts and contemporary topics in genetic regulation of livestock immune response and disease resistance

547 Biological Applications of Microscopy (FS HN 547) (2 0) Cr 2 Alt S offered 1994 *Prereq 6 credits in biological science permission of instructor* Principles and types of information obtained from light and electron microscopy techniques Photomicrography and photomacrography Demonstrations and structural data analysis with various biosystems

550 Population Genetics (Gen 550) (3-0) Cr 3 S *Prereq Stat 401* Basic concepts of qualitative and quantitative genetics of populations Equilibrium populations Forces that can change the genetic composition of populations For biologists and breeders of plants and animals

570 Advanced Meat Science and Applied Muscle Biology (2 2) Cr 3 S *Prereq 470* Chemistry and microscopic structure of muscle tissue Post-mortem changes in muscle and their relationship to muscle as a food Palatability and processing characteristics and factors affecting these characteristics Laboratory practice and experimentation

571 Advanced Meat Processing Principles and Technology (2 2) Cr 3 F *Prereq 470 or 570* Physical/chemical relationships during processing Effects of modern technology non meat additives and preservation techniques on quality and safety of processed meat Laboratory demonstration of principles and technology

590 Special Topics Cr 1 to 3 F S SS *Prereq Permission of instructor* Special topics in the animal sciences offered on demand and may be conducted by guest professors
- A Animal Breeding
- B Animal Nutrition
- C Meat Animal Production
- D Dairy Production
- E Meat Science
- F Physiology of Reproduction
- G Muscle Biology
- H Poultry Nutrition
- I Poultry Products
- J Experimental Surgery
- K Professional Topics

593 Workshop in Animal Science Cr 1 to 3 Offered as demand warrants *Prereq Permission of instructor* Graduate workshops in animal science and the technologies that impact the animal industry

Courses for Graduate Students, major or minor

603 Seminar in Animal Nutrition (1-0) Cr R S *Prereq Permission of instructor* Discussion of current literature preparation and submission of abstracts

610 Ruminology (3-0) Cr 3 Alt F offered 1993 *Prereq 519* Anatomy and physiology of the ruminant digestive tract Description and metabolism of ruminal and intestinal microbes Utilization of end products absorbed from tract Abnormal rumen function

618 Advanced Nutrition—Minerals and Vitamins (3 0) Cr 3 F *Prereq B B 405* Role of vitamins and minerals in mammalian intermediary metabolism Integration of cellular biochemistry and physiology of vitamins and minerals

619 Advanced Nutrition and Metabolism—Protein (2-0) Cr 2 S *Prereq B B 405* Digestion absorption and intermediary metabolism of amino acids and protein Regulation of protein synthesis and degradation Integration of cellular biochemistry and physiology of mammalian protein metabolism

620 Advanced Nutrition—Energy (2-0) Cr 2 S *Prereq B B 405* Energy constituents of feedstuffs and energy needs of animals as related to cellular biochemistry and physiology Interpretations of classical and current research

633 Seminar in Animal Reproduction (1-0) Cr 1 F *Prereq Permission of instructor* Discussion of current literature and preparation of reports on selected topics concerning physiology of reproduction

651 Methodology in Animal Breeding (3 0) Cr 3 F *Prereq 550 Stat 402* Techniques and statistical methods useful in animal breeding theory and application Correction for environmental effects estimation variance components and expected mean squares heritabilities genetic correlations selection index discounted gene flow and two-stage selection

652 Population Dynamics in Animal Breeding (2-2) Cr 3 S *Prereq 651* Mixed model animal prediction theory Writing equations for simple and multivariate models Using sources of relative information Equivalent model theory properties of solutions and analytical techniques for comparing models

653 Applied Poultry and Swine Breeding (2-0) Cr 2 Alt F offered 1993 *Prereq 651* Industrial application of breeding systems selection methods inbreeding and hybridization

654 Applied Beef and Dairy Cattle Breeding (2-0) Cr 2 Alt F offered 1994 *Prereq 651* Industrial application of breeding systems sire selection and evaluation and crossbreeding

657 Statistical Component Estimation in Animal Breeding (2 0) Cr 2 Alt F offered 1993 *Prereq 652* Methods of genetic parameter estimation useful in animal breeding including maximum likelihood restricted maximum likelihood and MIVQUE Emphasis on application and computing strategies

670 Molecular Biology of Muscle (B B 670) (3-0) Cr 3 Alt F offered 1994 *Prereq B B 405 420 or 502* Ultrastructure of muscle chemistry structure function and molecular biology of muscle proteins Molecular aspects of muscle contraction development and turnover Cytoskeletal proteins and dynamics

680 Modern Views of Nutrition (FS HN 680) (2-0) Cr R S Current concepts in nutrition and related fields Required for all graduate students in nutrition

684 Seminar in Meat Science (1 0) Cr 1 S *Prereq Permission of instructor* Discussion and evaluation of current topics in research publications in meat science

685 Seminar in Muscle Biology (1 0) Cr 1 S *Prereq Permission of instructor* Reports and discussion of recent literature and current investigations

699 Research
A Animal Breeding
B Animal Nutrition
C Meat Animal Production
D Dairy Production
E Meat Science
F Physiology of Reproduction
G Muscle Biology
H Poultry Nutrition
I Poultry Products

Anthropology

Michael B Whiteford Chair of Department

Professors Gradwohl Huang Rahman Warren Whiteford

Emeritus Professor Bower

Emeritus Associate Professor Schuster

Assistant Professors Coinman Wolff

Instructor Osborn

Undergraduate Study

An undergraduate major in anthropology can serve as the nucleus for a general liberal education or as the prerequisite for graduate training qualifying a person for positions in (1) college and university teaching (2) research and (3) administrative and applied positions in government and museums Fields of anthropology are cultural anthropology (ethnology social anthropology archaeology and linguistic anthropology) and physical anthropology (human biological evolution constitution and modern variations) Undergraduate students may obtain experience in archaeological and ethnological research

Anthropology majors may choose either a bachelor of arts or a bachelor of science degree both of which require 31 credits in anthroplogy A bachelor of arts degree is obtained by fulfilling the college general education requirements plus 6 additional credits in Groups I II and/or IV A bachelor of science degree is obtained by fulfilling the college general education requirements plus 6 additional credits in Group III

Undergraduate students with majors in anthropology are required to take the following anthropology courses 306 307 308 and 309 Either 201 or 202 may be counted toward the major but not both One year of a foreign language is required in addition to one course in statistics and one course in computer science Undergraduates majoring in anthropology are required to have a minor or a second major A minor in anthropology consists of at least 15 credits *and must include 306 or 309 and 307 or 308* and at least 6 other credits in courses numbered 300 or above

The department offers a series of undergraduate courses in cultural geography but neither major nor minor is offered in geography

LAS 230 is a cross-disciplinary course coordinated by the Department of Anthropology, but must be counted as an elective for Group IV credit

English proficiency requirement The department requires a grade of B– or better in Engl 105 If the grade in 105 is not a B– or better the student must take Engl 204 or 314 in which at least a B– is earned

The principal subdisciplines of anthropology are represented by the following

1 General cultural anthropology and ethnology 201 306 311 312 313 322 323, 325 326 327 332 333 335 338 339 340 380 490B

2 Archaeology 202 308 334 414 415 428 429 490A

3 Linguistic anthropology 309 490D

4 Physical anthropology 202 307 490C

Graduate Study

The department offers the degree master of arts with a major in anthropology Graduate courses are given in the areas of biological anthropology archaeology sociocultural anthropology linguistic anthropology history and theory and methodology Competence in one foreign language and in statistics is to be demonstrated A thesis generally based on original fieldwork is required

Courses Primarily for Undergraduate Students

201 *Introduction to Cultural Anthropology* (3 0) Cr 3 F S SS Comparative study of culture as key to understanding human behaviors in different societies Using a global cross-cultural perspective patterns of family life economic and political activities religious beliefs and the ways in which cultures change are examined

202 Introduction to Physical Anthropology and Archaeology (3 0) Cr 3 F S Human biological and cultural evolution survey of the evidence from fossil forms and archaeology as well as living primates and traditional cultures Introduction to methods of study in archaeology and physical anthropology

230 Third World Cultures in Global Perspective (LAS 230) See *Liberal Arts and Sciences Cross Disciplinary Studies*

306 Comparative Studies of World Cultures (3-0) Cr 3 S *Prereq 201 recommended* A comparative survey of similarities and differences in the world s major societal types examination of social institutions in hunting and-gathering agricultural pastoral and industrial societies techniques of cross-cultural comparison by means of recent and classic field studies

307 Physical Anthropology (2 2) Cr 3 S *Prereq 202 recommended* Human evolution as known from fossil evidence comparative primate studies and genetic variations in living populations Laboratory tutorial sessions include study and discussion of human osteology fossil hominids simple Mendelian traits and bio ethics in applied physical anthropology Materials fee

308 Archaeology (2 2) Cr 3 F *Prereq 202 recommended* Nature of archaeological evidence its recovery and use in reconstructing human behavior and environments of the past Field trip provides participatory experience in data collection Laboratory tutorial sessions include study and discussion of classification systems stone tool manufacture ceramic technology and ethics in public archaeology Materials fee

309 Linguistic Anthropology (Ling 309) (2 2) Cr 3 F *Prereq 201 recommended* Nature and development of human language capabilities biological basis of human language acquisition language learning among non-human primates human communication as part of culture Participatory lab focus on linguistic analysis of non Western languages

***311 (511 DL) Culture Change and Applied Anthropology** (3 0) Cr 3 F *Prereq 201 or 306* Theoretical and practical considerations of human cultural development Examination of cultural theories of change Culture contact and *acculturation* Dynamics of directed change in contemporary world cultures Principles theories and ethics of international development projects from a sociocultural perspective

***312 (512 DL) Psychological Anthropology** (3-0) Cr 3 Alt S offered 1995 *Prereq 201 or 306 recommended* Relationship of cultural social and personality factors in human behavior Cross cultural comparisons of child rearing practices cognitive development mental health deviancy ethno-psychiatry altered states of consciousness and psychological dimensions of culture change

***313 (513 DL) The Family and Kinship in Cross Cultural Perspective** (3-0) Cr 3 S *Prereq 201 recommended* Comparative and historical study of the family and kinship groups in cross-cultural perspective discussion of the structure cycle and functioning of family and kinship systems including the family in Western culture theoretical issues in contemporary family and kinship studies

322 (522 DL) The American Indian (Am In 322) (3-0) Cr 3 F SS *Prereq 201 or Am In 210 (recommended)* Origin distribution and traditional life of native peoples of North America Survey of culture areas ecology and subsistence language kinship life cycle political economic and religious systems impact of European contact

***323 (523 DL) Peoples and Cultures of Latin America** (Am In 323) (3-0) Cr 3 S *Prereq 201 or 306 recommended* Origin and distribution of native populations blending of Old and New World cultures *theoretical problems of peasant and tribal* societies discussion of economic social political and religious systems processes of change

***325 (525 DL) Peoples and Cultures of Africa** (Af Am 325) (3 0) Cr 3 Alt F offered 1993 *Prereq 201 or 306 recommended* Anthropological approaches to the study of African cultures in historical and cross-cultural perspectives Origin and distribution of peoples of Africa survey of culture areas examination of ecology and subsistence language kinship political economic and religious systems

***326 (526 DL) Peoples and Cultures of East and Southeast Asia** (3 0) Cr 3 Alt F offered 1994 *Prereq 201 or 306 recommended* Origin and development of early civilizations on the western rim of the Pacific Ocean including China Japan and mainland and insular Southeast Asia Survey of current issues among these societies in ecological historical and ideological contexts

***327 (527 DL) Anthropology of Human Settlements** (3-0) Cr 3 Alt F offered 1994 *Prereq 201 or 306 recommended* Spatial arrangements of people and facilities in ecological and evolutionary perspective proxemics cross cultural exploration of settlement systems and traditional dwellings applications

***332 (532 DL) American Indians Today** (Am In 332) (3 0) Cr 3 S *Prereq 201 or 306 322 or Am In 210 recommended* Conditions and issues of contemporary Native Americans historical background of eighteenth and nineteenth century Indian White relationships examination of legal status the reservation system treaty violations Indian militancy education and urbanization self determination social impact of resource development and other current concerns

333 (533 DL) African American Ethnology (Af Am 333) (3-0) Cr 3 Alt F offered 1994 *Prereq 201 recommended* Ethnographic approaches to the study of African Americans in a cross-cultural and historical perspective race relations in the Americas

***334 (534 DL) Prehistory of Africa** (3-0) Cr 3 Alt F offered 1994 *Prereq 202 recommended* Survey of African prehistory from the earliest human ancestors to the emergence of complex societies and centralized states Emphasis on the creativity of African cultures their responses to changing environments and transformations in human nature their contributions to the development of culture on a global scale

***338 (538 DL) Cultural and Biological Factors in Human Nutrition** (3-0) Cr 3 S *Prereq 201 or FS HN 107 recommended* Integration of perspectives from anthropology and nutrition exploration of cultural bases for nutritional beliefs and practices assessment of nutritional status and identification of malnutrition Protein-energy malnutrition nutritional anemias patterns of food avoidance/taboos toxicological problems causes of malnutrition intervention programs effects of social change on nutritional status

***339 (539 DL) Medical Anthropology** (3-0) Cr 3 Alt F offered 1993 *Prereq 201 or 306* Study of human health in cultural and environmental context comparison of health and disease patterns of western and non western populations use of epidemiological models in understanding illness and disease etiologies cross-culturally interrelationship between diet and culture

***340 (540 DL) Magic Witchcraft and Religion** (Relig 340) (3 0) Cr 3 Alt S offered 1994 *Prereq 201 or 306* Origin and development of indigenous magico religious systems myth and ritual therapeutic aspects symbols and meanings religion and sociocultural change including acculturation nativistic and revitalization movements

***380 (580 DL) Ethnography of the Visual Arts** (Art 380) (3-0) Cr 3 Alt S offered 1994 *Prereq 201 or 306 or 322 or 325 recommended* Survey of the visual arts of non Western societies in Africa Oceania and the Americas description of stylistic areas art as cultural symbol emphasis on the role of the artist and the function of the visual arts within particular cultural settings

***414 (514 DL) A Biocultural Perspective on Human Evolution** (3 0) Cr 3 Alt F offered 1993 *Prereq 202 307 or Biol 109* Integrated biological and cultural survey of human origins from prehominid times to the emergence of anatomically modern people Emphasis on interplay between anatomy (seen through fossil remains) and behavior (seen through archaeological traces) in ecological context

***415 (515 DL) Archaeology of North America** (Am In 415) (3-0) Cr 3 Alt S offered 1995 *Prereq 308 or 322 or Am In 210* Prehistory and early history of North America as reconstructed from archaeological evidence peopling of the New World culture-historical sequences of major culture areas north of the Rio Grande linkages of archaeological traditions with selected ethnohistorically known Native American groups

***428 (528 DL) Archaeological Laboratory Methods and Techniques** Cr 3 Alt S offered 1995 *Prereq 308 permission of instructor* Individual and/or group projects including laboratory processing and analysis of archaeological materials experiments in technologies such as manufacture of stone tools or ceramics writing a preliminary site report design and preparation of a museum display

***429 (529 DL) Archaeological Field School** Cr 8 to 10 SS 8 to 10 weeks *Prereq 308 permission of instructor* Summer field school for training in archaeological reconnaissance and excavation techniques documentation and interpretation of archaeological evidence Field trip fee

490 Independent Study Cr 1 to 5 each time taken *Prereq 9 credits in anthropology No more than 9 credits of Anthr 490 may be counted toward graduation*
A Archaeology
B Cultural Anthropology
C Physical Anthropology
D Linguistic Anthropology (Ling 490D)
H Honors

*See page 119 for information on dual listed (DL) courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Language and Culture (Ling 500) (3-0) Cr 3 Alt S offered 1995 *Prereq 309* Structure and design of language functional relationships between language cognition and culture linguistic change social and linguistic aspects of verbal behavior language world view and cognitive style

503 Primate Evolution (3 2) Cr 4 Alt F offered 1993 *Prereq 307* Comparative studies of the morphology and behavior of primates in neontological and paleontological perspective Laboratory analysis of locomotor adaptations and variability in habitus and heritage limb bones muscles and fossil casts Materials fee

510 Sociocultural Anthropology (3 0) Cr 3 Alt F offered 1994 *Prereq 6 credits in anthropology* Survey of historical and current developments in topical and theoretical approaches to sociocultural anthropology Examination and assessment of controversies new research directions formulation of research paradigms for advanced studies

***511 (311 DL) Culture Change and Applied Anthropology** (3 0) Cr 3 F *Prereq 6 credits in anthropology 201 or 306* Theoretical and practical considerations of human cultural development Examination of cultural theories of change Culture contact and acculturation Dynamics of directed change in contemporary world cultures Principles theories and ethics of international development projects from a sociocultural perspective

***512 (312 DL) Psychological Anthropology** (3 0) Cr 3 Alt S offered 1995 *Prereq 6 credits in anthropology 201 or 306 recommended* Relationship of cultural social and personality factors in human behavior Cross cultural comparisons of child rearing practices cognitive development mental health deviancy ethno psychiatry altered states of consciousness and psychological dimensions of culture change

***513 (313 DL) The Family and Kinship in Cross Cultural Perspective** (3 0) Cr 3 S *Prereq 6 credits in anthropology 201 recommended* Comparative and historical study of the family and kinship groups in cross-cultural perspective discussion of the structure cycle and functioning of family and kinship systems including the family in Western culture theoretical issues in contemporary family and kinship studies

***514 (414 DL) A Biocultural Perspective on Human Evolution** (3 0) Cr 3 Alt F offered 1993 *Prereq 202 307 or Biol 109* Integrated biological and cultural survey of human origins from prehominid times to the emergence of anatomically modern people Emphasis on interplay between anatomy (seen through fossil remains) and behavior (seen through archaeological traces) in ecological context

***515 (415 DL) Archaeology of North America** (3-0) Cr 3 Alt S offered 1995 *Prereq 308 or 322 or Am In 210* Prehistory and early history of North America as reconstructed from archaeological evidence peopling of the New World culture-historical sequences of major culture areas north of the Rio Grande linkages of archaeological traditions with selected ethnohistorically known Native American groups

520 Cultural Continuity and Change in the Prairie-Plains (Am In 520) (3-0) Cr 3 Alt S offered 1994 *Prereq 322 or 415 or 429* Ecological adaptations sociocultural changes and continuities of traditions among Prairie and Plains Indian groups through time impacts of Euro American society and technology on Indians of the Great Plains perspectives from ecology archaeology ethnology history and contemporary literary sources

***522 (322 DL) The American Indian** (3-0) Cr 3 F SS *Prereq 201 or Am In 210 (recommended)* Origin distribution and traditional life of native peoples of North America Survey of culture areas ecology and subsistence language kinship life cycle political economic and religious systems impact of European contact

***523 (323 DL) Peoples and Cultures of Latin America** (3-0) Cr 3 S *Prereq 6 credits in anthropology 201 or 306 recommended* Origin and distribution of native populations blending of Old and New World cultures theoretical problems of peasant and tribal societies discussion of economic social political and religious systems processes of change

***525 (325 DL) Peoples and Cultures of Africa** (3-0) Cr 3 Alt F offered 1993 *Prereq 6 credits in anthropology 201 or 306 recommended* Anthropological approaches to the study of African cultures in historical and cross-cultural perspectives Origin and distribution of peoples of Africa survey of culture areas examination of ecology and subsistence language kinship political economic and religious systems

***526 (326 DL) Peoples and Cultures of East and Southeast Asia** (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in anthropology 201 or 306 recommended* Origin and development of early civilizations on the western rim of the Pacific Ocean including China Japan and mainland and insular Southeast Asia Survey of current issues among these societies in ecological historical and ideological contexts

***527 (327 DL) Anthropology of Human Settlements** (3 0) Cr 3 Alt F offered 1994 *Prereq 6 credits in anthropology 201 or 306 recommended* Spatial arrangements of people and facilities in ecological and evolutionary perspective proxemics cross-cultural exploration of settlement systems and traditional dwellings applications

***528 (428 DL) Archaeological Laboratory Methods and Techniques** Cr 3 Alt S offered 1995 *Prereq 308 permission of instructor* Individual and/or group projects including laboratory processing and analysis of archaeological materials experiments in technologies such as manufacture of stone tools or ceramics writing a preliminary site report design and preparation of a museum display

***529 (429 DL) Archaeological Field School** Cr 8 to 10 SS 8 to 10 weeks *Prereq 308 permission of instructor* Summer field school for training in archaeological reconnaissance and excavation techniques documentation and interpretation of archaeological evidence Field trip fee

530 Ethnographic Field Methods Cr 3 to 5 Alt F offered 1994 May be taken for 8 to 10 credits in summer field school *Prereq 6 credits in anthropology permission of instructor* Field training experience in ethnography Problems emphasizing field studies in the contemporary societies of the world Focus on techniques of data gathering and analysis

***532 (332 DL) American Indians Today** (3-0) Cr 3 S *Prereq 6 credits in anthropology 201 or 306 322 or Am In 210 recommended* Conditions and issues of contemporary Native Americans historical background of eighteenth and nineteenth century Indian White relationships examination of legal status the reservation system treaty violations Indian militancy education and urbanization self-determination social impact of resource development and other current concerns

***533 (333 DL) African American Ethnography** (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in anthropology 201 recommended* Ethnographic approaches to the study of African Americans in a cross cultural and historical perspective race relations in the Americas

***534 (334 DL) Prehistory of Africa** (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in anthropology* Survey of African prehistory with emphasis on sub Saharan regions Relationship between human fossil record and early cultures archaeological contribution to language history links between prehistoric and contemporary cultures

***538 (338 DL) Cultural and Biological Factors in Human Nutrition** (3 0) Cr 3 S *Prereq 6 credits in anthropology 201 or FS HN 107 recommended* Integration of perspectives from anthropology and nutrition exploration of cultural bases for nutritional beliefs and practices assessment of nutritional status and identification of malnutrition Protein energy malnutrition nutritional anemias patterns of food avoidance/taboos toxicological problems causes of malnutrition intervention programs effects of social change on nutritional status

***539 (339 DL) Medical Anthropology** (3 0) Cr 3 Alt F offered 1993 *Prereq 6 credits in anthropology 201 or 306 recommended* Study of human health in cultural and environmental context comparison of health and disease patterns of western and non western populations use of epidemiological models in understanding illness and disease etiologies cross-culturally interrelationship between diet and culture

***540 (340 DL) Magic Witchcraft and Religion** (3 0) Cr 3 Alt S offered 1994 *Prereq 6 credits in anthropology 201 or 306 recommended* Origin and development of indigenous magico religious systems myth and ritual therapeutic aspects symbols and meanings religion and socio-cultural change including acculturation nativistic and revitalization movements

543 Development Advisory Team (DAT) Training Workshop (T SC 543 U St 543) (1 0) Cr 1 (S F) F *Prereq Senior or graduate classification* One week workshop conducted prior to beginning of fall semester Survey of cultural dimension of effective management development planning communications and team building skills necessary for international development consultancies Materials fee Limited enrollment

555 Seminar in Archaeology (3 0) Cr 3 Alt S offered 1994 *Prereq 308 or 414 or 429 or 514* Examination of traditional and contemporary methods and theories involved in the study of human behavior in the past

***580 (380 DL) Ethnography and the Visual Arts** (Art H 580) (3-0) Cr 3 Alt S offered 1994 *Prereq 6 credits in anthropology 201 or 306 or 322 or 325 recommended* Survey of the visual arts of non Western societies in Africa Oceania and the Americas description of stylistic areas art as cultural symbol emphasis on the role of the artist and the function of the visual arts within particular cultural settings

590 Special Topics (Ling 590) Cr 1 to 5 *Prereq 10 credits in anthropology senior or graduate classification*

598 Advanced Topics in Anthropology (Ling 598) (3-0) Cr 3 each

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*See page 119 for information on dual listed courses

Courses for Graduate Students

641 Implementing International Agricultural and Rural Development Projects Problems and Issues (T SC 641) (2-0) Cr 2 F *Prereq T SC 543* Cross-cultural and multidisciplinary team approaches to international development project design implementation and evaluation Survey of development policies and procedures of USAID and other donor agencies

699 Research

Geography (Geog)

Primarily for Undergraduate Students

100 World Geography (3-0) Cr 3 F S Introduction to the geographer s view of the world regionalization spatial interaction people land relationships migration modernization and underdevelopment urbanization emphasis on selected regions and countries

290 Independent Study Cr 2 each time taken maximum of 6 *Prereq Permission of instructor*

324 Cultural Geography (3 0) Cr 3 F Origin distribution and influence of cultural processes such as discovery invention evolution and diffusion of phenomena on the landscape

325 Cultural Geography Asia (3 0) Cr 3 S People and their environment in Asia Evolution of cultural landscape and culturo-geographic regions Emphasis on areas of current concern

326 Cultural Geography Anglo America (3 0) Cr 3 S Analysis of the physical and cultural features that characterize and differentiate the landscapes and regions of the United States and Canada

327 Cultural Geography Africa (3 0) Cr 3 S People and their environment in Africa Evolution of cultural landscape an culturo-geographic regions Emphasis on areas of recent concern

328 Europe (3 0) Cr 3 S Topical study of a real variation in the physical and human environment management of resources settlements political and economic developments

490 Independent Study Cr 2 each time taken maximum of 6 *Prereq 6 credits in geography permission of instructor*

495 Field Study Cr 4 to 6 S *Prereq 2 credits in geography permission of instructor* Correlated readings and field work Field trip to a selected region in the U S or abroad to study cultural or physical geographic relationships usually scheduled for the period between fall and spring semesters Written report required Field trip fee

Architecture

Robert T Segrest Chair of Department

Professors Block Engelbrecht Findlay Heemstra Kitzman Mukerjea Shao

Emeritus Professors Kainlauri McKeown Shank Stone

Associate Professors Bassler Bloomer Horwitz Osterberg Palermo Patterson Rice Toporek

Assistant Professors Berman Cardinal-Pett Chan Conway Fisher Griggs Maves Miller Paxson Preston Schulte Schwennsen, Spears

Undergraduate Study

The undergraduate program in architecture is a five-year curriculum leading to the bachelor of architecture degree The program provides opportunities for general education as well as preparation for professional practice and/or graduate study An optional one-semester foreign study program is offered to fourth year students

The undergraduate curriculum includes one year of preprofessional coursework and four years of professional coursework Admission to the professional degree program is based on the applicant s performance in the completed preprofessional curriculum previous high school record (or transfer record where applicable) portfolio and essay evaluations and on available departmental resources

For a more complete undergraduate program description see *College of Design Curricula*

Graduate Study

The graduate program in architecture offers opportunities for both professional and post-professional study leading to the master of architecture degree In each of its three options the program emphasizes the relationship between professional education and architectural research culminating in a thesis as a demonstration of both professional competence and a deep understanding of the discipline of architecture

The **three-and-one-half-year option** is designed for individuals with an undergraduate degree other than architecture Students explore a full range of architectural subjects through seminars an intensive sequence of design studios and thesis One hundred credits are required including 40 graduate credits

The **two-year option** is for individuals with a preprofessional undergraduate major in architecture Following the completion of the requisite professional courses the students is expected to develop an individualized course of study leading to the thesis Sixty credits are required including 30 graduate credits

The ***one-year option*** is a post-professional course of study leading to the master of architecture and is designed for individuals with an accredited professional degree in architecture (B Arch or M Arch) The post-professional option affords the opportunity for advanced study in architectural theory and design leading to the thesis Thirty credits are required

The graduate program also offers a course of study leading to the degree master of science in architectural studies This course of study is designed for students with nonarchitecture backgrounds and students with previous degrees in architecture wishing to conduct specialized graduate level research in architecture Students work closely with faculty who are engaged in high-level research and scholarship Thirty-four credits are required

Double-degree programs are currently offered with the Department of Community and Regional Planning (M Arch /M C P) and the College of Business (M Arch /M B A)

Financial support in the form of teaching and research assistantships is available

Contact the department office for specific curricula

The following courses are open to graduate students for minor credit only 420 421 422 423 424 425 426 427 434 437 451 466

Courses Primarily for Undergraduate Students

102 Pre Architecture Design (1-6) Cr 4 F S SS A studio course focused on problem solving through design with emphasis on creative conceptualization and synthetic thinking Explorations of the relationship between human beings and the built environment Investigations of visual structures and their order and exercises to develop ability to communicate about form and space Field trip fee materials fee

201 Architectural Design I (1-15) Cr 6 F *Prereq Completion of the preprofessional program and admission into the professional program* An exploration of architectural design through studio projects that focus on the issues of human need the environment and the elements of architecture design conventions and representational strategies Primary emphasis on constructive elements Field trip fee materials fee

202 Architectural Design II (1 15) Cr 6 S *Prereq 201* A continuation of 201 with studio projects that focus on the relationship between the formal and material in terms of the conceptual and experiential dimensions of architecture Primary emphasis on design process theories methodologies and criticism Field trip fee materials fee

221 222 History of Western Architecture (3 0) Cr 3 each F S Introductory survey with emphasis on the cultural visual natural and constructed context 221 Ancient to mid 19th century Western architecture 222 Mid 19th century to present Western architecture Field trip fee materials fee

230 Design Communications I (0-6) Cr 2 F SS *Prereq Admission to the professional program* Tools and techniques of freehand drawing Exercises to develop manual skill and perceptual sensitivity Investigation of various representational systems and techniques and their applications to the design process specifically to the coursework in 201 Field trip fee materials fee

232 Design Communications II (0-6) Cr 2 S SS *Prereq 230* Tools and techniques of freehand drawing Exercises to develop manual skill and perceptual sensitivity Advanced study of representational systems and techniques and their applications to the design process specifically to the coursework in 202 Field trip fee materials fee

234 Introduction to Computer Applications in Architecture (Engr 234) (1-5) Cr 3 S *Prereq Credit or enrollment in 201* Computer applications in architecture with an emphasis on graphics computer hardware (VAX) software and terminology an introduction to the creation manipulation analysis and storage of computer model geometry specification writing using the computer

240 Materials and Assemblies I (3 1) Cr 4 F *Prereq Completion of the preprofessional program and admission into the professional program* Introduction to common architectural materials their physical properties and integration into light construction subsystems Model building codes gravitational and climatic forces and simplified methods of analysis for the preliminary design of building systems Field trip fee materials fee

271 Human Behavior and Environmental Theory (3-0) Cr 3 S *Prereq Completion of the preprofessional program and admission into the professional program* Exploration of theories that describe social structure and order and the manner in which individuals and societies organize themselves and structure their environment Field trip fee materials fee

301 Architectural Design III (1-15) Cr 6 F *Prereq 202* A consideration of landscape as a constructed cultural artifact Projects address the perceptual aspects and strategies of situation and location examination of environmental phenomena and patterns of use and settlement as revealed and affected by the architectural artifact Development of a critical design process is stressed Field trip fee materials fee

302 Architectural Design IV (1 15) Cr 6 S *Prereq 301* A continuation of 301 examining housing in the urban situation diverse scales of use and occupation within the city as shaped by cultural tendencies Projects examine collective and individual identities related by the condition of adjacency the ability to consider varieties of scale within a project and a further development of critical and technical methods Field trip fee materials fee

332 Two Dimensional Studio (0-6) Cr 2 each time taken up to a maximum of 8 credits for 332 and 532 combined F S Explorations of two-dimensional design through manipulation of the design elements in association with the design principles Emphasis on materials techniques and color/shape relationships with consideration of expressive aesthetic symbolic and optical potentials Field trip fee materials fee

334 Computer Applications in Architecture (2 2) Cr 3 F S *Prereq 201 234 or Dsn S 201* Current and potential applications of digital computers in architecture Projects employing computer-graphic methods Awareness of programming languages related to applications Field trip fee materials fee

335 Three Dimensional Studio (ArtVS 335) (0-6) Cr 2 each time taken up to a maximum of 8 credits for 335 and 535 combined F S Investigation of basic sculptural media modeling in clay wood carving stone carving casting in plaster and metal welding and other constructing techniques Field trip fee materials fee

351 Solar Home Design (Phys 351) (3-0) Cr 3 S *Prereq 202* Architectural design and technical analysis of residential structures with emphasis on energy construction and solar energy utilization Field trip fee materials fee

357 Environmental Forces in Architecture (3-0) Cr 3 F S *Prereq Completion of the preprofessional program and admission into the professional program* Introduction to environmental forces that describe the function of buildings in terms of human comfort and patterns of occupancy Emphasis on analytical rules of thumb and calculation methods that contribute to design synthesis A design process is developed utilizing building climatology control of thermal luminous and acoustic environments Field trip fee materials fee

372 Design Inquiry (3 0) Cr 3 S *Prereq 271* An overview of methods of inquiry in design Different ways of thinking about design and design processes in architecture associating appropriate programming and design activities with project objectives planning and implementing an effective process to meet those objectives Field trip fee materials fee

401 Architectural Design V (1 15) Cr 6 F *Prereq 302* Examination of architecture s dialectical relationship with technology and culture the consideration of the constitution and configuration of public space in its historic and contemporary conditions Studio projects stress the interpretation and integration of structural environmental and communication systems within the architectural construct Field trip fee materials fee

402 Architectural Design VI (1 15) Cr 6 S *Prereq 401* A continuation of 401 closely examining specific urban situations Advanced studio projects stress the consideration of diverse conditions which create and impact the built environment Urban design project Foreign study and urban studio options Field trip fee materials fee

403 Architectural Design VII (1 15) Cr 6 F *Prereq 402* This comprehensive studio provides a forum for the demonstration of individual competence in architectural design The work is rigorously examined relative to the entire undergraduate program of study Field trip fee materials fee

404 Architectural Design VIII (1 15) Cr 6 S *Prereq 403 483* Each student is required to produce a Diploma Project Experimentation with the design process is encouraged and architectural issues are examined pursuant to the development of personal design principles Field trip fee materials fee

***420 (520 DL) History of American Architecture** (3-0) Cr 3 F *Prereq Junior classification* A survey of the historical development of American architecture Field trip fee materials fee

***421 (521 DL) Topics in Ancient Architecture** (3-0) Cr 3 S *Prereq Junior classification* The history theory and principles of ancient architecture and urban design considering relationships to the culture visual arts site and surroundings Field trip fee materials fee

***422 (522 DL) Topics in Medieval Architecture** (3-0) Cr 3 F *Prereq Junior classification* The history theory and principles of medieval architecture and urban design considering relationships to the culture visual arts site and surroundings Field trip fee materials fee

***423 (523 DL) Topics in Renaissance to Mid Eighteenth Century Architecture** (3-0) Cr 3 S *Prereq Junior classification* The history theory and principles of renaissance to mid-eighteenth century architecture and urban design considering relationships to the culture visual arts site and surroundings Field trip fee materials fee

***424 (524 DL) Topics in Nineteenth Century Architecture** (3-0) Cr 3 F *Prereq Junior classification* The history theory and principles of nineteenth century architecture and urban design considering relationships to the culture visual arts site and surroundings Field trip fee materials fee

***425 (525 DL) Topics in Twentieth Century Architecture** (3-0) Cr 3 F S *Prereq Junior classification* The history theory and principles of twentieth century architecture and urban design considering relationships to the culture visual arts site and surroundings Field trip fee materials fee

***426 (526 DL) History Theory and Criticism of Pre Columbian Mexican Architecture** (3-0) Cr 3 F *Prereq Junior classification* Study of built environments of pre-conquest Mexico and Central America including the emergence florescence and demise of architecture styles urban and ceremonial centers religion social structure and associated arts Field trip fee materials fee

***427 (527 DL) History Theory, and Criticism of Chinese Architecture** (3-0) Cr 3 S *Prereq Junior classification* Survey of the history and theoretical concept of Chinese built environment with emphasis on the morphology of built form and its relation to art landscape design and urban structure Field trip fee materials fee

***431 (531 DL) Experiential Design Presentation** (0 7) Cr 3 F S *Prereq 202 230* Architectural graphic procedures Emphasis on perspective design shades and shadows fundamentals of tone and line rendering and environmental contexts Field trip fee materials fee

434 Computer aided Architectural and Environmental Design (1-4) Cr 3 S *Prereq 334 Com S 107 or 205* Emphasis on application of the computer as a design tool topical applications and computer graphic methods development of computer software for architectural and environmental problem solving Field trip fee materials fee

***436 (536 DL) Advanced Experiential Design Presentation** (0-9) Cr 3 each time taken to a maximum of 6 credits F S *Prereq 302 431* Advanced perspective design using various presentation media Field trip fee materials fee

437 Architectural Photography (3-0) Cr 3 F *Prereq 202* Emphasis on use of the camera and lighting in photographing drawings and interior and exterior building environments Field trip fee materials fee

***448 Materials and Assemblies II** (3 0) Cr 3 F *Prereq 446* Investigation of the materials and integrated systems found in complex construction assemblies Emphasis on determination and utilization of appropriate forms of material assemblies and structural systems for large scale construction Field trip fee materials fee

***451 (551 DL) Alternative Energy Systems in Architecture** (3-0) Cr 3 F *Prereq 352 or graduate standing* Alternative energy sources and systems for architecture Field trip fee materials fee

458 Environmental Control Systems (3-0) Cr 3 S *Prereq 357* Overview of architectural environmental control systems in response to occupant comfort patterns of use health and safety regulations Emphasis on the analytical rules of thumb and calculation methods necessary to provide integrated design synthesis of technical systems within architecture A process is developed to aid in understanding the use and design of mechanical electrical plumbing fire safety transportation and conveying systems and subsystems Field trip fee materials fee

466 Housing Design Issues (3-0) Cr 3 F S Social economic and environmental factors related to the planning and design of single family and multi family housing Open to students in related disciplines Field trip fee

467 Preservation Restoration and Rehabilitation (3 0) Cr 3 S *Prereq Senior*

classification Construction standards and procedures for preserving restoring reconstructing and rehabilitating existing buildings following the guidelines of the National Park Service and the National Trust for Historic Preservation Field trip fee materials fee

471 Design for All People (3-0) Cr 3 S Principles and procedures of *universal design in response to* the varying ability level of users Assessment and analysis of existing buildings and sites with respect to standards and details of accessibility for all people including visually impaired mentally impaired and mobility restricted users Design is neither a prerequisite nor a required part of the course Enrollment open to students majoring in related disciplines Field trip fee

481 Design Methods Seminar (3-0) Cr 3 S *Prereq 302* Investigation of the discipline of design Methods and procedures are studied as a unified process with emphasis on design cycles systematic analysis and conceptual development *Field trip fee materials fee*

482 Professional Practice (3 0) Cr 3 F *Prereq 302 440 or Mgmt 316* Emphasis on the *organization* of the architect s office agreements contract documents and related material Field trip fee materials fee

483 Diploma Seminar (2 0) Cr 2 F *Prereq Credit or enrollment in 403* Discussions and exercises culminating in the completion of a personal statement of intent for the Diploma Project (Arch 404) *Field trip fee materials fee Offered on a* satisfactory fail basis only

489 Foreign Study Seminar (2 0) Cr 2 F S *Prereq 220 301* Preparatory seminar for the departmental foreign study program Historic and contemporary architectural and urban design examples and issues related to travel itinerary are studied Field trip fee materials fee

490 Independent Study F S SS Cr 2 to 9 *Prereq Written approval of instructor and department chair on required form* Independent investigation
A Design Communications Material fee
B Design
C Technical Systems Field trip fee
D Architectural History
E Behavioral Studies
F Practice
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 Architectural Design and Communication I (1 15) Cr 6 F *Prereq Admission to the M Arch program* Emphasis on design process the elements concepts and precedents of architectural design and graphic communications Field trip fee materials fee

502 Architectural Design and Communication II (1-15) Cr 6 S *Prereq 501* Emphasis on the con textual parameters of architectural design and their graphic representation Field trip fee materials fee

503 Architectural Design and Communication III (1-15) Cr 6 SS *Prereq 502* Emphasis on architectural systems and design presentation graphics Field trip fee materials fee

***520 (420 DL) History of American Architecture** (3-0) Cr 3 FI *Prereq Graduate classification* A survey of the historical development of American architecture Field trip fee materials fee

***521 (421 DL) Topics in Ancient Architecture** (3-0) Cr 3 S *Prereq 221 222 and senior classification or graduate standing* The history theory and principles of ancient architecture and urban design considering relationship to the culture visual arts site and surroundings Field trip fee materials fee

***522 (422 DL) Topics in Medieval Architecture** (3 0) Cr 3 F *Prereq 221 222 and senior classification or graduate standing* The history theory and principles of medieval architecture and urban design considering relationships to the culture visual arts site and surroundings Field trip fee materials fee

***523 (423 DL) Topics in Renaissance to Mid eighteenth Century Architecture** (3-0) Cr 3 S *Prereq 221 222 and senior classification or graduate standing* The history theory and *principles of renaissance to mid eighteenth* century architecture and urban design considering relationships to the culture visual arts site and surroundings Field trip fee materials fee

***524 (424 DL) Topics in Nineteenth Century Architecture** (3 0) Cr 3 F *Prereq 221 222 and senior classification or graduate standing permission of instructor* The history theory and principles of nineteenth century architecture and urban design considering relationships to the culture visual arts site and surroundings

***525 (425 DL) Topics in Twentieth Century Architecture** (3 0) Cr 3 F S *Prereq 221 222 and senior classification or graduate standing* The history theory and principles of twentieth century architecture and urban design considering relationships to the culture visual arts site and surroundings Field trip fee materials fee

***526 (426 DL) History Theory and Criticism of Pre Columbian Mexican Architecture** (3-0) Cr 3 F *Prereq Senior classification or graduate standing* Built environments of pre conquest Mexico and Central America including the emergence flores cence and demise of architectural styles urban and *ceremonial centers religion social structure* and associated arts Field trip fee materials fee

***527 (427 DL) History Theory and Criticism of Chinese Architecture** (3-0) Cr 3 S *Prereq Senior classification or graduate standing* The history and theoretical concept of Chinese built environment with emphasis on the morphology of built form and its relationship to art landscape design *and urban* structure Field trip fee materials fee

528 Topical Studies in History Theory and *Criticism of Architecture* *(2-0 or 3-0)* Cr 2 or 3 each time taken F S *Prereq 221 222 or senior classification or graduate standing Field trip fee materials fee*
A Pre Modern
B Modern
C American
D Oriental and Other Non European
E Architects
F Historic Preservation
G Technical Structural and Programmatic
I *Urban Design*
J Vernacular Architecture

532 Advanced Two Dimensional Studio (0 6) *Cr 2 each time taken* up to a maximum of 8 credits for 332 and 532 combined F S *Prereq 332 or graduate standing* Advanced studies in visual design Emphasis on materials techniques scale and color/shape relationships Potential of expressive decorative and optical effects for independent and architecturally integrated projects Field trip fee materials fee

534 Advanced Computer aided Architectural Design (1-4) Cr 3 each time taken maximum of 6 credits F S *Prereq 434 permission of instructor* Emphasis on concepts algorithms data structures and data base development evaluation and development of software for complex data management and applications in architectural design Field trip fee materials fee

535 Advanced Three Dimensional Studio (0-6) Cr 2 each time taken up to a maximum of 8 credits for 335 and 535 combined F S *Prereq 335 or graduate standing* Advanced investigation of sculptural expression with emphasis on individual *projects Field trip fee materials fee*

540 Materials and Assemblies I (3 2) Cr 4 F *Prereq Graduate standing* Introduction to common architectural materials their physical properties and integration into light construction subsystems Building codes forces and methods of analysis for design of building systems Field trip fee materials fee

545 Construction Methods (3-0) Cr 3 S *Prereq Graduate standing* Advanced studies of *construction methods and procedures Field trip fee* materials fee

548 Materials and Assemblies II (3 0) Cr 3 F *Prereq 546* Investigation of the materials and integrated systems found in complex construction assemblies Emphasis on determination and utilization of appropriate forms of material assemblies and structural systems for large scale construction Field trip fee materials fee

***551 (451 DL) Alternative Energy Systems in Architecture** (3 0) Cr 3 F *Prereq 352 or graduate standing* Alternative energy sources and systems for architecture Field trip fee materials fee

552 Architectural Luminous Environment (3 0) Cr 3 S *Prereq 401 452 or graduate standing* An integrated study of the concepts of lighting natural *and artificial lighting* visual stimuli comfort discomfort perception and active and passive systems of control Emphasis on daylighting design Field trip fee materials fee

553 Architectural Thermal Environment (3 0) Cr 3 S *Prereq 401 452 or graduate standing* An integrated study of the concepts of thermal stimuli comfort *active and passive systems of control* Field trip fee materials fee

554 Architectural Acoustic Environment (3 0) Cr 3 F *Prereq 401 452 or graduate standing* An integrated study of the concepts of acoustic stimuli noise control room acoustics and sound isolation Field trip fee materials fee

557 Advanced Studies in Building Systems (3 0) Cr 3 F *Prereq Graduate standing* Advanced studies of the integration and development of *technical building systems Field trip fee materials* fee

558 Appropriate Technologies for Architecture *(3-0) Cr 3 S Prereq Graduate standing* Appropriate uses of technology in building design Field trip fee materials fee

566 Housing for Specific Groups (3-0) Cr 3 S *Prereq 401 or graduate standing* Principles of gerontology as related to planning programming designing and evaluating housing environments for elderly residents *The continuum of age segregated* and age integrated housing options for older people including independent living congregate living shared living continuing care retirement communities and nursing care environments Design is neither a prerequisite nor a required part of the course Open to students in related disciplines with an interest in gerontology and/or housing Field trip fee materials fee

572 Architectural Programming (3 0) Cr 3 S *Prereq 372 or graduate standing* Determination of space site and cost factors for design Emphasis on methods techniques and applications Field trip fee materials fee

573 Post Occupancy Evaluation (3 0) Cr 3 F *Prereq 401 or graduate standing* Methods of evaluating the physical social and psychological performance of buildings following construction and occupancy with emphasis on behavioral response to the environment and its role in the design process Field trip fee materials fee

575 Contemporary Urban Design Theory (3 0) Cr 3 F S *Prereq 401 or graduate standing* Current urban design theory and its application to urban *problems Field trip fee materials fee*

577 Social Impact of the Built Environment (3-0) Cr 3 S *Prereq Graduate standing* Interdisciplinary review and analysis of social scientific research applied to architectural design Field trip fee materials fee

582 Professional Practice Seminar (1-0 to 3-0) Cr 1 to 3 each time taken up to a maximum 6 cr F S *Prereq 482 or graduate classification* Investigation of the changing relationships between *professional practice and the needs of society Field* trip fee materials fee

584 Real Estate Investment Aspects of *Architecture* (3-0) Cr 3 S *Prereq 401* Principles of real estate investment and an analysis of their influence on architectural design Field trip fee materials fee

585 Theory I Contemporary Theories (3-0) Cr 3 F *Prereq Graduate classification* A selected study of contemporary architectural texts The nature of the text its relationship to architectural practice and the social political and intellectual context of its production

587 Theory II Theories and History (3-0) Cr 3 F *Prereq Graduate classification* The relevance of the theoretical device Interpretations of language form and meaning to explore relationships to the production of contemporary architecture

589 Research Methods (3 0) Cr 3 F *Prereq 272 401 or graduate standing* Lecture/seminar course pertinent to the development of graduate level research The nature of architectural research the development of a research topic and methods of information gathering Case studies evaluation methods and critical writing in history theory and criticism related to architectural scholarship Field trip fee materials fee

590 Special Topics Cr 1 to 5 each time taken F S SS Prereq *Written approval of instructor and department chair on approved form* Investigation of architectural issues having a specialized nature Field trip fee materials fee

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*See page 119 for description of dual listed (DL) courses

Courses for Graduate Students, major or minor

601 Advanced Architectural Design I (1 15) Cr 6 F *Prereq Admission into the graduate program* Complex architectural design problems incorporating aesthetic technological social and contextual issues Field trip fee materials fee

602 Advanced Architectural Design II (1 15) Cr 6 S *Prereq 601* Complex architectural design problems incorporating aesthetic technological social and contextual issues Field trip fee materials fee

603 Advanced Architectural Design III (1-15) Cr 6 each time taken up to a maximum of 12 credits F S *Prereq Professional degree in architecture or advanced standing in the graduate program* Architectural and urban design problems Field trip fee materials fee

690 Advanced Architectural Design IV (1 3 to 1-15) Cr 2 to 6 each time taken up to a maximum of 12 credits F S *Prereq 602* Architectural design projects commensurate with interests of student requiring approval of program of study committee Field trip fee materials fee

699 Research (1 18) Cr 9 F S SS

Art and Design

Nancy Polster Chair of Department

Professors Allen Bro Evans Fowles Heggen Miller Smith Sontag

Emeritus Professors Danielson Held Meixner Petersen Pickett Watson

Associate Professors Akkurt Baer Chinn Croyle Dake Friedman Gibbs S Herrnstadt Lehner Lorr Malven McClain McIlrath Mickelson Polster Stout Tartakov Warme Weinkein

Emeritus Associate Professor Sreenivasam

Assistant Professors Beecher Bruene Cunnally Dong Fontaine Horn Johnson Jones Kaneshiro, Sage Weber

Instructor Biechler

Undergraduate Study

The department offers work for the degrees bachelor of fine arts and bachelor of arts

Programs in general studio art and/or art history craft design drawing/painting/printmaking graphic design interior design and visual studies are possible within four curricula art and design—B F A art and design—B A graphic design and interior design see *College of Design Curricula* Each of these curricula affords excellent preparation for a variety of career opportunities or a basis for graduate study in art and design disciplines

The curriculum in art and design leading to the B F A provides for a studio concentration Students select an emphasis in one of the following areas (1) craft design (ceramics fiber jewelry and metal wood) (2) drawing/painting/printmaking (3) visual studies (calligraphy computer-aided art and design illustration photography two- and three-dimensional mixed media)

Students working toward the B A in art and design pursue studies in a related or supporting area by means of a second major minor and/or approved program of study that meets the individual needs of a student Art history art education craft design drawing/painting/printmaking visual studies pre-graphic design and pre-interior design courses may be taken to fulfill the art and design program of study

The curriculum in graphic design leads to the B F A degree Emphasis is on creative problem solving the design process and the visual organization of communication media

The curriculum in interior design leads to the B F A degree Emphasis is on the student s application of the design process to solve problems of the interior environment creatively based on a knowledge of techniques materials resources human factors and an awareness of interrelated professional responsibility

Students planning a career in art education preparing for certification to teach art in grades kindergarten through twelve should matriculate in the art and design curriculum leading to the B F A degree This will provide a strong studio background Many requirements for teacher certification are course options within general education requirements Students should work closely with a department adviser in planning their program of study to maximize their ability to meet entrance requirements to the teacher education program For general requirements for teacher certification see *College of Education*

Transfer students with studio credits from other colleges and universities must present for department review a portfolio of work done in those courses in order to have the credits apply toward specific studio requirements Students are advised to present this portfolio of work upon admission and prior to registration for classes

A fee will be assessed when field trips are indicated In many courses studio fees for materials are required

The department offers no minor but participates in the undergraduate minor in design studies

If space is available nonmajors may take elective coursework in the following areas art and design foundations (Art) art history theory and criticism (Art H) craft design (ArtCD) drawing/painting/printmaking (ArtDP) and visual studies (ArtVS)

Graduate Study

The department offers work for the degrees master of arts in art and design and master of fine arts in graphic design and interior design and minor work for students with majors in other departments Degree specializations leading to the master of arts degree are available in art education craft design, intermedia drawing/painting/printmaking graphic design and interior design Within the general area of craft design the following emphases are available ceramics fiber jewelry and metal and wood design The master of fine arts degree is offered only in graphic design and interior design

Graduate students who have not completed an undergraduate program of study substantially equivalent to that required of undergraduates in the department can expect that additional supporting coursework as determined by the graduate faculty will be required

The master of arts program requires a minimum of 30 credits including an art and design seminar a studio concentration a history/criticism course, elective courses outside the department and completion of a thesis or thesis-exhibition

Students in the master of arts studio programs select an original area of investigation for the thesis or thesis-exhibition For further information see *Graduate College Master of Science and Master of Arts* The thesis-exhibition is based on the development of a body of original artwork which is presented in a culminating exhibition A written paper is required as part of the thesis-exhibition The program of study committee determines whether a thesis or thesis-exhibition option is appropriate

Graduate students in the art education specialization leading to the M A degree participate in a 30 credit program of study which is linked with the New Art Basics research project If they do not hold teacher certification students may work toward acquiring this as part of their graduate study A creative component is required for the master of arts degree and fulfilled through individually focused discipline-specific classroom research culminating in a written summary of research results

The master of fine arts program requires a minimum of 60 credits including an art and design seminar a studio concentration history and criticism courses a teaching practicum elective courses outside the department or area of study and the completion of a thesis-exhibition or thesis

The M F A thesis-exhibition is composed of two parts a substantial exhibition and a written statement that describes the development of the work in the exhibition its objectives and its historical and cultural points of reference A thesis may be an appropriate alternative but some portion of

the work should entail an element of design problem-solving in the form of a visual product

Credit earned at Iowa State University or other institution for the master of arts degree may be applied toward the master of fine arts degree at the discretion of the program of study committee

Applicants to the graduate program should have an undergraduate major in an art or design area and demonstrate the ability to do technically competent and original work through the presentation of a slide portfolio for faculty review Past academic performance and the quality of studio work are critical in the admission process A minimum 3 0 GPA in the student s undergraduate major is the standard for full admission to the graduate program Available studio space within the program areas will also determine admission and changes yearly due to graduate students progress in their programs of study

Prospective students are advised to contact the graduate coordinator with specific questions about admission procedures and portfolio review Application and additional program information may be obtained from the Department of Art and Design College of Design Iowa State University Ames Iowa 50011-3092

The department participates in the inter-departmental minor in housing (see *Index*)

Open to graduate students for minor credit only ArtCD 420 422 427 447 ArtDP 430 438 ArtGr 387 388 ArtID 355 356 357 464 465 467 Art H 380 381 382 383 385 386 387 389 391 394 396 ArtVS 302 303 304 408

Art (Art)

Courses Primarily for Undergraduate Students

101 Foundations of Art and Design (3 0) Cr 3 F S Understanding the work of the artist and designer through an examination of the design process artistic style and selected art and design forms Primarily for nonmajors

108 Visual Foundations I (0 6) Cr 3 F S Exploring the visual order creative process and interaction of two and three dimensional design Introduction to color Materials fee

109 Visual Foundations II (0 6) Cr 3 F S *Prereq 108* Continued exploration of the visual order creative process and interaction of two and three dimensional design and color Materials fee

110 Orientation to Art and Design (1 0) Cr R F S Overview of the department and university with special emphasis on curricula program planning and study skills Advising policy and procedures student services Offered on a satisfactory fail basis only

130 Drawing I (1-6) Cr 3 F S Introduction to drawing concepts with practical application various media materials and subject matter Materials fee

230 Drawing II (0 6) Cr 3 F S *Prereq 130* Emphasis on composition and techniques in relation to visual imagery Materials fee

494 Art and Design in Europe Seminar (1 0) Cr 1 S *Prereq Junior classification in art and design or related curriculum* The cultural and historical aspects of art and design in Western Europe in preparation for summer travel Area of study varies each time offered Offered on a satisfactory fail basis only

G Graphic Design
I Interior Design
N Art History

***495 (595 DL) Art and Design in Europe** Arr Cr 3 SS *Prereq 494 permission of instructor* International study abroad program in western Europe Visits to design studios art museums and educational facilities Related activities depending on specific area of study which may vary each time offered Tour expenses to be paid by the student
G Graphic Design
I Interior Design
N Art History

497 Studio Internship Arr Cr 1 to 6 each time taken maximum of 6 F S SS *Prereq Advanced classification in a department curriculum Written approval of supervising instructor and department chair on required form in advance of semester of enrollment* Supervised experience with a cooperating artist or studio Offered on a satisfactory fail basis only

498 Museum/Gallery Internship Arr Cr 1 to 6 each time taken maximum of 6 F S SS *Prereq Advanced classification in a department curriculum Written approval of supervising instructor on required form in advance of semester of enrollment* Supervised experience with a cooperating museum or gallery or art center Offered on a satisfactory fail basis only

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 Seminar (3 0) Cr 3 F *Prereq Permission of instructor* Presentation and discussion of basic issues in contemporary art and design

517 Teaching Practicum Arr F S *Prereq Graduate classification* Classroom observation supervised teaching experiences group discussions and readings

***595 (495 DL) Art and Design in Europe** Arr Cr 3 SS *Prereq Graduate classification 494 or equivalent permission of instructor* International study abroad program in western Europe Visits to design studios art museums and educational facilities Related activities depending on specific area of study which may vary each time offered Tour expenses to be paid by the student
G Graphic Design
I Interior Design
N Art History

598 Museum/Gallery Internship Arr Cr 1 to 6 each time taken maximum of 6 F S SS *Prereq Graduate classification and permission of instructor Written approval in advance of semester of enrollment* Supervised experience with a cooperating museum or gallery or art center Offered on a satisfactory fail basis only

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*See page 119 for information on dual listed (DL) courses

Courses for Graduate Students, major or minor

697 Studio Internship Arr Cr var maximum of 9 F S SS *Prereq Graduate classification and approval of department chair* Supervised off-campus learning experience with a prominent artist designer or firm

698 Current Issues in Art and Design Cr 1 to 3 maximum of 9 *Prereq Graduate classification* Selected issues in contemporary art and design literature and work Topics and readings vary each time offered
G Graphic Design
I Interior Design
K Interdisciplinary Design

699 Research Cr var F S SS
A Thesis
B Thesis exhibition

Craft Design (ArtCD)

Courses Primarily for Undergraduate Students

220 Wood Design I (0-6) Cr 3 F S Introduction to wood as a design medium Design and creation of wooden forms Emphasis on visual communication and hand processes Materials fee

222 Ceramics I (0-6) Cr 3 F S Introduction to clay construction decoration and firing Materials fee

227 Jewelry and Decorative Metalsmithing I (0-6) Cr 3 F S Design of jewelry and metal objects using basic construction techniques Materials fee

320 Wood Design II (0 6) Cr 3 each time taken maximum of 6 F S *Prereq 220* Design and fabrication of furniture forms Emphasis on visual communication advanced shaping and joining processes Materials fee

322 Ceramics II (0-6) Cr 3 F S *Prereq 222* Wheel throwing hand building kiln preparation Materials fee

325 Craft Design Seminar (2-0) Cr 2 Alt S offered 1994 *Prereq 3 credits in craft design* Discussion of contemporary issues in craft design through lectures presentations and field trips Field trip fee

327 Jewelry and Decorative Metalsmithing II (0-6) Cr 3 F S *Prereq 227* Design of jewelry and hollow forms combining traditional and contemporary methods Materials fee

343 Fiber Forms (0 6) Cr 3 S Three dimensional contemporary fiber construction Emphasis on visual problem solving and conceptual development of ideas using processes and techniques such as knotting wrapping plaiting netting feltmaking sculptural fabric manipulation and basketry Materials fee

344 Weaving (0 6) Cr 3 F S Exploration of weaving on various looms Color and pattern development through interlocking Emphasis on floor loom and frame loom fabric construction Materials fee

345 Fiber and Fabric Design (0-6) Cr 3 F Shaped patterned manipulated and embellished textiles using contemporary and traditional yarn thread and cloth techniques Materials fee

346 Resist and Dyed Fabric Design (0-6) Cr 3 F S Studio exploration of dye and resist processes Two- and three dimensional problems with emphasis on visual imagery Materials fee

347 Printed Fabric Design (0-6) Cr 3 F S Repeat pattern overlapping transparent colors and compositions for fabric design using screenprinting techniques and direct application of pigments Materials fee

***420 (520 DL) Wood Design III** (0-6) Cr 3 each time taken maximum of 12 F S *Prereq 320* Independent design and creation of furniture forms Emphasis on research and development of furniture forms utilizing advanced and/or innovative processes Materials fee

***422 (522 DL) Ceramics III** (0 6) Cr 3 each time taken maximum of 12 F S *Prereq 322* Experimentation with clays glazes and firing techniques Materials fee

***427 (527 DL) Jewelry and Decorative Metalsmithing III** (0-6) Cr 3 each time taken maximum of 12 F S *Prereq 327* Design of jewelry and hollow forms using advanced construction techniques Materials fee

***447 (547 DL) Fiber/Fabric Studio Problems** (0 6) Cr 3 each time taken maximum of 9 F S *Prereq 6 credits from among 343 344 345 346 347* Advanced exploration of imagery using woven and surface design processes Emphasis on personal development and exploration of ideas Field trip Materials and field trip fees

490 Independent Study Cr 1 to 6 each time taken F S SS *Prereq Written approval of instructor and department chair on required form in advance*

of semester of enrollment Offered on a graded basis or a satisfactory fail basis Student must have completed craft design coursework appropriate to planned independent study
C Ceramics (materials fee)
F Fiber (materials fee)
H Honors (materials fee)
M Metals (materials fee)
W Wood Design (materials fee)

493 Workshop Cr 1 to 3 each time taken SS *Prereq Permission of instructor* Intensive 2 to 4 week studio exploration Topics vary each time offered and may have prerequisites
C Ceramics (materials fee)
F Fiber (materials fee)
M Metals (materials fee)
W Wood Design (materials fee)

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***520 (420 DL) Wood Design Studio** (0-6) Cr 3 each time taken maximum of 12 F S *Prereq Graduate classification permission of instructor* Independent design and creation of furniture forms Emphasis on research and development of furniture forms utilizing advanced and/or innovative processes Materials fee

***522 (422 DL) Ceramics Studio** (0 6) Cr 3 each time taken maximum of 12 F S *Prereq 322 graduate classification permission of instructor* Experimentation with clays glazes and firing techniques Materials fee

***527 (427 DL) Jewelry and Decorative Metalsmithing Studio** (0 6) Cr 3 each time taken maximum of 12 F S *Prereq Graduate classification permission of instructor* Design of jewelry and hollow forms using advanced construction techniques Materials fee

***547 (447 DL) Fiber/Fabric Studio Problems** (0-6) Cr 3 each time taken maximum of 9 F S *Prereq Graduate classification permission of instructor* Advanced exploration of imagery using woven and surface design processes Emphasis on personal development and exploration of ideas Field trip Materials and field trip fees

590 Special Topics Cr arr F S SS *Prereq Bachelor s degree in art and/or design or evidence of satisfactory equivalency in specialized area Written approval of instructor and department chair on required form in advance of semester of enrollment*
C Ceramics (materials fee)
F Fiber (materials fee)
M Metals (materials fee)
W Wood Design (materials fee)

593 Workshop Cr 1 to 3 each time taken SS *Prereq Graduate classification permission of instructor* Intensive 2 to 4 week studio exploration Topics vary each time offered and may have prerequisites
C Ceramics (materials fee)
F Fiber (materials fee)
M Metalsmithing (materials fee)
W Wood Design (materials fee)

Drawing/Painting/Printmaking (ArtDP)

Courses Primarily for Undergraduate Students

233 Watercolor Painting (0-6) Cr 3 F S *Prereq Art 230* Painting using waterbased media Materials fee

238 Painting I (0-6) Cr 3 F S *Prereq Art 230* Introduction to painting using acrylic and/or oil media Materials fee

330 Drawing III Life Drawing (0-6) Cr 3 each time taken maximum of 9 F S *Prereq Art 230* Drawing from the human figure Materials fee

338 Painting II (0-6) Cr 3 F S *Prereq 238* Oil and/or acrylic media composition and expression Materials fee

***356 (556 DL) Relief Printmaking** (0-6) Cr 3 F *Prereq Art 230* Traditional woodcut and linoleum cut printmaking processes in black and white multiblock color and reduction color printing Exploration of collographs and forms of relief printmaking used separately and in combination with woodcuts Materials fee

***357 (557 DL) Monoprinting** (0-6) Cr 3 S *Prereq 238* Studio exploration of monoprint and monotype processes black and white and color techniques and various transfer techniques Development of basic knowledge production procedures and drawing skills experimentation Materials fee

***358 (558 DL) Lithography** (0-6) Cr 3 each time taken maximum of 9 F S *Prereq Art 230* The planographic printmaking process theory and practice Studio procedures drawing and printing skills applied to metal plate lithography Materials fee

***359 (559 DL) Intaglio** (0 6) Cr 3 each time taken maximum of 9 F S *Prereq Art 230* Studio exploration of intaglio printmaking processes Development of basic knowledge and production procedures drawing and printing skills Materials fee

***430 (530 DL) Drawing IV** (0-6) Cr 3 each time taken maximum of 9 F S *Prereq Art 230* Figurative and/or non-figurative drawing with advanced work in media composition and theory Materials fee

***438 (538 DL) Painting III** (0-6) Cr 3 each time taken maximum of 9 F S *Prereq 338* Figurative and/or non-figurative painting with advanced work in media composition and theory Materials fee

490 Independent Study Cr 1 to 6 each time taken F S SS *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Offered on a graded basis or a satisfactory-fail basis Student must have completed related drawing/painting/printmaking coursework appropriate to planned independent study
A Drawing
B Painting
H Honors (materials fee)
P Printmaking (materials fee)

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*See page 119 for information on dual listed (DL) courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***530 (430 DL) Drawing Studio** (0 6) Cr 3 each time taken maximum of 9 F S *Prereq 12 credits of undergraduate drawing* Figurative and/or non figurative drawing with advanced work in media composition and theory Materials fee

***538 (438 DL) Painting Studio** (0-6) Cr 3 each time taken maximum of 9 S *Prereq 9 credits of undergraduate painting* Figurative and/or non-figurative painting with advanced work in media composition and theory Materials fee

***556 (356 DL) Relief Printmaking** (0-6) Cr 3 F *Prereq Graduate classification permission of instructor* Traditional woodcut and linoleum cut printmaking process in black and white multiblock color and reduction color printing Exploration of collographs and forms of relief printmaking used separately and in combination with woodcuts Materials fee

***557 (357 DL) Monoprinting Studio** (0-6) Cr 3 S *Prereq Graduate classification permission of instructor* Studio exploration of monoprint processes black and white and color techniques and various transfer techniques Development of basic knowledge production procedures and drawing skills experimentation Materials fee

***558 (358 DL) Lithography Studio** (0-6) Cr 3 each time taken maximum of 9 F S *Prereq Graduate classification permission of instructor* The planographic printmaking process theory and prac tice Studio procedures drawing and printing skills applied to metal plate lithography Materials fee

***559 (359 DL) Intaglio Studio** (0-6) Cr 3 each time taken maximum of 9 F S *Prereq Graduate classification permission of instructor* Studio exploration of intaglio printmaking processes Development of basic knowledge and production procedures drawing and printing skills Materials fee

590 Special Topics Cr arr F S SS *Prereq Bachelor s degree in art and/or design or evidence of satisfactory equivalency in specialized area Written approval of instructor and department chair on required form in advance of semester of enrollment*
A Drawing
B Painting
P Printmaking (materials fee)

Art Education (ArtEd)

Courses Primarily for Undergraduate Students

211 Introduction to Art Education (0-6) Cr 2 F S Organizing art experiences for the classroom Materials fee

313 Practicum Art Education Arr Cr 1 each time taken maximum of 3 F S *Prereq Permission of instructor in advance of semester of enrollment* Field experience in art education programs

490 Independent Study Cr 1 to 3 each time taken F S SS *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Offered on a graded basis or a satisfactory fail basis Student must have completed art and/or education coursework appropriate to planned independent study
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

513 Introduction to New Art Basics Cr 3 SS *Prereq Permission of instructor* Taught in workshop format intensive 2 to 3 week exploration Overview of higher order thinking skills instruction for visualization visual thinking metaphoric thinking visual logic and human cultural and historic contexts Design of discipline-specific thinking skills strategies Materials fee

514 Multicultural Perspectives (3-0) Cr 3 F *Prereq 513 application to the graduate program in art education* Developing an understanding of the nature roles and functions of the visual arts Emphasis on designing methodology for effective classroom instruction in human cultural and historical contexts Experience at classroom based research site Materials fee

515 Visual Thinking Skills Education (3-0) Cr 3 S *Prereq 513 admission to the graduate program in art education* Using theory to inform and direct the design of teaching methodology Developing effective classroom techniques for promoting visual ideation Experience at classroom based research site Materials fee

516 Classroom Research Seminar (3-0) Cr 3 F *Prereq 514 515* Classroom based research theory and practice Review of literature for individual research in visual education Development of focused graduate research project Materials fee

517 518 Teaching Practicum Arr Cr 3 to 6 each maximum of 6 S *Prereq 516 all courses in the art education program advanced registration required* Supervised experience and individually designed research in teaching art 517 in elementary school 518 in secondary school

590 Special Topics Cr arr F S SS *Prereq Bachelor s degree in art and/or design or evidence of satisfactory equivalency in specialized area Written approval of instructor and department chair on required form in advance of semester of enrollment*

593 Workshop Cr 1 to 3 each time taken SS *Prereq Graduate classification evidence of satisfactory experience in area of specialization*

Intensive 2 week studio exploration Topics vary each time offered Materials fee

599 Creative Component Cr var *Prereq Concurrent enrollment or credit in 517 and/or 518* Individually focused discipline specific classroom research Written summary of research exhibition of research results

Graphic Design (ArtGr)

Courses Primarily for Undergraduate Students

177 Introduction to Graphic Design (2-0) Cr 2 S *Prereq Art 108 credit or classification in Art 109 130 Dsn S 121* Overview of the historical cultural and social issues related to the practice of visual communication Field trip field trip fee

270 Graphic Design Studio I (0 8) Cr 4 F *Prereq Art 109 130 ArtGr 177 Dsn S 121 admission to the graphic design program through department review* Application of design and color principles to the development of letterforms and to principles of symbology Selected topics in design Field trip Field trip and materials fee

271 Graphic Design Studio II (0-8) Cr 4 S *Prereq Art 230 ArtGr 270* Introduction to typographic systems and to the conceptual and skill development related to visual communication problem solving through image making techniques Selected topics in design Field trip Field trip and materials fee

277 Graphic Design Internship Seminar (1-0) Cr 1 F *Prereq Credit or enrollment in 270* Procedural and ethical concerns related to the graphic design internship Formation of personal goals preparation of résumé and plans for internship Offered on a satisfactory fail basis only

370 Graphic Design Studio III (0-10) Cr 5 F *Prereq 271 credit or enrollment in 387* Development and preparation of design concepts for application to the printing process Selected topics in design Field trip Field trip and materials fees

371 Graphic Design Studio IV (0-10) Cr 5 S *Prereq 370* Application of design systems as appropriate to visual communication problem solving Selected topics in design Field trip Field trip and materials fees

***374 (574 DL) Exhibition Design** (0 6) Cr 3 *Prereq 271 or Art ID 365 or Arch 301* Visual communication applied to exhibition design focusing on educational or interactive museum exhibitions trade show booth design and modular unit design for traveling exhibitions Emphasis on translation of graphic information to a three-dimensional space Field trip Materials and field trip fees

***375 (575 DL) Advanced Typography** (0-6) Cr 3 *Prereq Credit or enrollment in 370* Advanced typographic theory exploring formal and informal structures with considerations to the historic styles from the Dadaists through the present day Materials fee

***376 (576 DL) Graphic Design Methodology** (2-2) Cr 3 *Prereq Credit or enrollment in 370* Analysis study and application of scientific systematic and nontraditional problem solving and problem seeking techniques Materials fee

***379 (579 DL) Environmental Information Design** (0-6) Cr 3 *Prereq Credit or enrollment in 370 or admission to the BPMI program* Analysis of the functional and aesthetic implications of environmental communication Design of graphics and architectural elements that assist in way finding such as signage systems transportation graphics maps and other orientation systems Field trip Materials and field trip fees

***387 (587 DL) Graphic Design History/Theory/Criticism I** (3-0) Cr 3 F *Prereq Art H 280 281 Dsn S 121* Significant works from late nineteenth century to the 1960s to provide understanding of the development and character of graphic design Influential forces artists and designers

***388 (588 DL) Graphic Design History/Theory/Criticism II** (3-0) Cr 3 S *Prereq 387* The theory and history of contemporary graphic design including designers from the 1960s through the present Analysis of the way new materials and technology are leading to present design forms

470 Graphic Design Studio V (0 10) Cr 5 F *Prereq 371 480* Exploration of theoretical and conceptual concerns of visual communication problem solving Selected topics in design Field trip Materials and field trip fees

471 Graphic Design Studio VI (0 10) Cr 5 S *Prereq 470 481 credit or enrollment in 388* Directed senior thesis project portfolio and résumé preparation Selected topics in design Field trip Field trip and materials fees

472 Photographic Art Direction (0 6) Cr 3 *Prereq 271 ArtVS 229 or JI MC 309 and 310 or admission to BPMI program* Relationship of photography to graphic design Art direction of photographs photograms and related darkroom experimentation Must have a camera with adjustable shutter speeds and lens openings Materials fee

477 Graphic Design Practicum (0-6) Cr 3 each time taken maximum of 6 *Prereq 370 portfolio review and permission of instructor* Graphic design problem solving within and outside of the university community Individual and group projects for non profit clients selected by the instructor Field trip Field trip and materials fees

480 Graphic Design Internship Arr Cr 3 SS *Prereq 277 permission of instructor registration in advance of enrollment* Graphic design experience in an off campus professional environment

481 Graphic Design Professional Practices (3 0) Cr 3 F *Prereq 480 credit or enrollment in 470* Professional design management ethics setting up a new business client/designer relationships contractual options billing practices and effective operating procedures Field trip field trip fee

484 Selected Studies in Graphic Design Cr 1 to 3 each time taken maximum of 9 *Prereq Permission of instructor* Investigation of special issues related to graphic design Topics vary each time offered Field trip Materials and field trip fees

490 Independent Study Cr 1 to 6 each time taken F S SS *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Offered on a graded basis or a satisfactory fail basis Student must have completed related graphic design coursework appropriate to planned independent study

A Theory Criticism and Methodology (materials fees)
B Two Dimensional Design (materials fees)
C Three Dimensional Design (materials fees)
H Honors (materials fees)
I Internship/Cooperative (in-depth experience other than ArtGr 480 satisfactory fail only)

493 Workshop Cr 1 to 3 each time taken SS *Prereq Evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered Materials fee

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

570 Graphic Design Studio I (0-10) Cr 5 F *Prereq Graduate classification* Design research and graphic design problem solving Materials fee

571 Graphic Design Studio II (0 10) Cr 5 S *Prereq 570* Design research and graphic design problem solving Materials fee

***574 (374 DL) Exhibition Design** (0 6) Cr 3 *Prereq Graduate classification in graphic design interior design or architecture permission of instructor* Visual communication applied to exhibition design focusing on educational or interactive museum exhibitions trade show booth design and modular unit design for traveling exhibitions Emphasis on translation of graphic information to a three dimensional space Field trip Materials and field trip fees

***575 (375 DL) Advanced Typography** (0-6) Cr 3 *Prereq Graduate classification permission of instructor* Advanced typographic theory exploring formal and informal structures with consideration to the historic styles from the Dadaists through present day Materials fee

***576 (376 DL) Graphic Design Methodology** (2-2) Cr 3 *Prereq Graduate classification permission of instructor* Analysis study and application of scientific systematic and nontraditional problem solving and problem-seeking techniques Materials fee

***579 (379 DL) Environmental Information Design** (0-6) Cr 3 *Prereq Graduate classification in graphic design interior design or architecture permission of instructor* Analysis of the functional and aesthetic implications of environmental communication Design of graphics and architectural elements that assist in way finding such as signage systems transportation graphics maps and other orientation systems Field trip Materials and field trip fees

584 Selected Studies in Graphic Design Cr arr *Prereq Graduate classification permission of instructor* Investigation of special issues related to graphic design Topics vary each time offered Field trip Materials and field trip fees

***587 (387 DL) Graphic Design History/Theory/Criticism I** (3 0) Cr 3 F *Prereq Graduate classification permission of instructor* Significant works from late 19th century to the 1960s to provide understanding of the development and character of graphic design Influential forces artists and designers

***588 (388 DL) Graphic Design History/Theory/Criticism II** (3 0) Cr 3 S *Prereq Graduate classification permission of instructor* The theory and history of contemporary graphic design including designers of the 1960s through the present Analysis of the way new materials and technology are leading to present design forms

590 Special Topics Cr arr F S SS *Prereq Bachelor s degree in graphic design or evidence of satisfactory equivalency in specialized area Written approval of instructor and department chair on required form in advance of semester of enrollment*

A Theory Criticism and Methodology (materials fees)
B Two-Dimensional Design (materials fees)
C Three Dimensional Design (materials fees)

593 Workshop Cr 1 to 3 each time taken SS *Prereq Graduate classification evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered Materials fee

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*See page 119 for information on dual listed (DL) courses

Courses for Graduate Students, major or minor

672 Advanced Graphic Design Studio (0 10) Cr 5 each time taken maximum of 10 F S *Prereq MFA classification* Materials fee

690 Advanced Topics Cr arr F S SS *Prereq MFA classification permission of instructor* Materials fee

699 Research Cr var F S SS

A Thesis
B Thesis Exhibition

Interior Design (ArtID)

Courses Primarily for Undergraduate Students

167 Interior Design Foundations (2-8) Cr 6 S *Prereq Art 108 130 credit or enrollment in Art 109 Dsn S 121* Introduction to the profession of interior design overview of issues creative problem solving creative conceptualization and thinking

Exercises to develop ability to communicate about form space and visual order Field trip Field trip and materials fees

265 Interior Design Studio I (0 12) Cr 6 F *Prereq Art 109 Dsn S 121 ArtID 167 credit or enrollment in Engr 125 enrollment in ArtID 350 or Arch 240 admission to the interior design program through department review* Creative interior design problem solving and graphic communication as applied to interior design problems Design exploration using hand techniques and computer-aided methods Materials fees

267 Interior Design Studio II (0 12) Cr 6 S *Prereq 265 350 or Arch 240 Engr 125 enrollment in 351 and 355* Creative interior design problem solving and graphic communication using hand techniques and computer aided methods Materials fee

350 Interior Systems I (4 0) Cr 4 F *Prereq Admission to the interior design program through department review* Structural principles mechanical systems and standard construction methods as related to interior design Field trip Field trip and materials fees

351 Interior Systems II (4 0) Cr 4 S *Prereq 265 350 or Arch 240* Characteristics of interior furnishings materials and systems emphasizing selection criteria and written specifications Field trip Field trip and materials fees

352 Interior Systems III (4 0) Cr 4 F *Prereq 351 credit or classification in 365* Light color and sound as related to interior spaces Lighting and acoustics principles and techniques to implement design objectives Field trip Field trip and materials fees

355 Interior Design History/Theory/Criticism I (2 0) Cr 2 S *Prereq Dsn S 121* Interior spaces furnishings and decorative arts from a historic and multicultural perspective Field trip Field trip and materials fee

356 Interior Design History/Theory/Criticism II (2-0) Cr 2 F *Prereq Dsn S 121* Interior spaces furnishings and decorative arts from a historic and multicultural perspective Field trip Field trip and materials fees

357 Interior Design History/Theory/Criticism III (2-0) Cr 2 S *Prereq Dsn S 121* Twentieth century interior spaces furnishings and decorative arts Field trip Field trip and materials fees

365 Interior Design Studio III (0-8) Cr 4 F *Prereq 267 351 T C 104 enrollment in 352 and 356* Emphasis on residential interior applications and requirements of special groups Field trips Field trip and materials fees

367 Interior Design Studio IV (2 6) Cr 4 S *Prereq 352 365 credit or enrollment in 355 356 357* Emphasis on nonresidential settings and accommodation of specialized activities including office interiors Programming code requirements and solution refinements Field trips Field trip and materials fees

369 Interior Design Internship Seminar (1-0) Cr 0 5 to be repeated for 1 credit F S *Prereq Enrollment or credit in 365* Procedural and ethical concerns relating to interior design internship Preparation of placement credentials formation of personal goals finalization of internship plans Offered on a satisfactory fail basis only

460 Interior Design Internship Arr Cr 3 SS *Prereq Satisfactory completion of all 300-level interior design coursework and Arch 240 if substituting for ArtID 350* Professional interior design off-campus experience

461 Interior Design Professional Practices (2-0) Cr 2 F *Prereq 460* Professional ethics business procedures and written specifications Field trip Field trip and materials fees

***464 (564 DL) Selected Studies in Interior Design** (0-6) Cr 3 each time taken maximum of 6 *Prereq 12 credits in design related courses and permission of instructor* Investigation of special issues with emphasis on their translation into design application Topics vary each time offered Materials fee

***465 (565 DL) Interior Design Studio V** (0-8) Cr 4 F *Prereq 460 credit or enrollment in 461* Design research and refined problem solving methods as applied to institutional interior design Functional analysis program development and detailed solution development of large scale complex spaces Field trips Field trip and materials fees

467 Interior Design Studio VI (0-8) Cr 4 S *Prereq 465 and all required interior systems and history/theory/criticism courses* Advanced design research and problem solving Potential directed senior thesis project portfolio preparation Field trips Field trip and materials fees

***469 (569 DL) Computer aided Interior Design** (0-6) Cr 3 *Prereq 365* In-depth exploration of computer aided design with applications appropriate to the interior design field Materials fee

490 Independent Study Cr 1 to 6 each time taken F S SS *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Offered on a graded basis or a satisfactory fail basis Student must have completed related interior design coursework appropriate to planned independent study
H Honors

493 Workshop Cr 1 to 3 each time taken SS *Prereq Evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered Materials fee

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***564 (464 DL) Selected Studies in Interior Design** (0-6) Cr 3 each time taken maximum of 6 *Prereq 12 credits in design related courses permission of instructor* Investigation of special issues with emphasis on their translation into design application Topics vary each time offered Materials fee

***565 (465 DL) Interior Design Studio** (0-8) Cr 4 F *Prereq Graduate classification* Design research and refined problem solving methods as applied to institutional interior design Functional analysis program development and detailed solution development of large scale complex spaces Field trips Field trip and materials fees

566 Interior Design Studio (0-6) Cr 3 *Prereq Graduate classification* Design research and interior design problem solving Field trip Materials and field trip fees

567 Interior Design Studio (0-8) Cr 4 *Prereq Graduate classification* Advanced design research and interior design problem solving Field trips Field trip and materials fees

568 Contemporary Interior Design Concerns (2-0) Cr 2 *Prereq Permission of instructor* Contemporary designers and design trends including interiors furnishings and product design Field trips Field trip and materials fees

***569 (469 DL) Computer aided Interior Design** (0 6) Cr 3 *Prereq Graduate classification* In depth exploration of computer-aided design with applications appropriate to the interior design field Materials fee

590 Special Topics Cr arr F S SS *Prereq Bachelor s degree in interior design or evidence of satisfactory equivalency in specialized area Written approval of instructor and department chair on required form in advance of semester of enrollment* Materials fee

593 Workshop Cr 1 to 3 each time taken SS *Prereq Graduate classification evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered Materials fee

*See page 119 for information on dual listed (DL) courses

Courses for Graduate Students, major or minor

666 Advanced Interior Design Studio (0-6) Cr 3 each time taken maximum of 9 F S *Prereq M F A classification* Materials fee

690 Advanced Topics Cr arr F S SS *Prereq M F A classification permission of instructor* Materials fee

699 Research Cr var F S SS
A Thesis
B Thesis Exhibition

Art History (Art H)

Courses Primarily for Undergraduate Students

280 281 History of Art I and II (3 0) Cr 3 each 280 F 281 S Development of the visual arts of western civilization including painting sculpture architecture and crafts 280 From prehistoric through Gothic 281 From the Renaissance to the twentieth century

***380 (580 DL) Ethnography of the Visual Arts** (Anthr 380 580) (3-0) Cr 3 Alt S offered 1994 *Prereq Anthr 201 or 306 or 322 or 325 recommended* Survey of the visual arts of non Western societies in Africa Oceania and the Americas description of stylistic areas art as cultural symbol emphasis on the role of the artist and the function of the visual arts within particular cultural settings

***381 (581 DL) Art and Architecture of India** (3-0) Cr 3 Alt F offered 1993 South Asian art and architecture from earliest times to the present day The development of style the social uses and symbolism that give imagery its meaning

***382 (582 DL) Art and Architecture of Asia** (3-0) Cr 3 Alt F offered 1994 A selective history of visual imagery from a variety of major Asian traditions chiefly India China Japan Sri Lanka Cambodia and Indonesia

***383 (583 DL) Greek and Roman Art** (3-0) Cr 3 Alt S offered 1995 Greek art from Neolithic and Hellenistic periods Roman art from the traditional founding to the end of the empire in the West

***385 (585 DL) Renaissance Art** (3-0) Cr 3 Alt S offered 1994 European art including painting sculpture architecture and crafts thirteenth through sixteenth centuries

***386 (586 DL) Baroque and Rococo Art** (3 0) Cr 3 Alt F offered 1994 European art including painting sculpture architecture and crafts seventeenth and eighteenth centuries

***387 (587 DL) Nineteenth Century Art** (3-0) Cr 3 Alt S offered 1995 European and American art and architecture from 1780 to 1900 focusing on the major monuments of western Europe Neo Classicism Romanticism Realism Impressionism and Post Impressionism

***389 (589 DL) Modern American Art** (3 0) Cr 3 S American art from 1870 to the present

***391 (591 DL) Modern European Art** (3 0) Cr 3 Alt F offered 1993 Painting sculpture architecture and crafts of Europe 1870 to the present

***394 (594 DL) Women in Art** (W S 394 594) (3 0) Cr 3 Alt S offered 1995 The lives careers and achievements of women artists and the related cultural environment from the Middle Ages to contemporary times in Europe and America The feminist movement beginning in the 1970s and specifically feminist issues in art that are becoming widespread in the artistic culture

***396 (596 DL) History of Photography** (3 0) Cr 3 Alt F offered 1994 Survey of the evolution of photography and photojournalism from the 1830s to the present seen from an art historical perspective emphasizing causative factors cultural influences and major masters and schools

490 Independent Study Cr 1 to 6 each time taken F S SS *Prereq Written approval of instructor*

and department chair on required form in advance of semester of enrollment Offered on a graded basis or a satisfactory fail basis Student must have completed art history coursework appropriate to planned independent study
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***580 (380 DL) Ethnography of the Visual Arts** (Anthr 580 380) (3 0) Cr 3 Alt S offered 1994 *Prereq Graduate classification permission of instructor Anthr 201 or 306 or 322 or 325 recommended* Survey of the visual arts of non Western societies in Africa Oceania and the Americas description of stylistic areas art as cultural symbol emphasis on the role of the artist and the function of the visual arts within particular cultural settings

***581 (381 DL) Art and Architecture of India** (3 0) Cr 3 Alt F offered 1993 *Prereq Graduate classification permission of instructor* South Asian art and architecture from earliest times to the present day The development of style special uses and symbolism that give imagery its meaning

***582 (382 DL) Art and Architecture of Asia** (3-0) Cr 3 Alt F offered 1994 *Prereq Graduate classification permission of instructor* A selective history of visual imagery from a variety of major Asian traditions chiefly India China Japan Sri Lanka Cambodia and Indonesia

***583 (383 DL) Greek and Roman Art** (3-0) Cr 3 Alt S offered 1995 *Prereq Graduate classification permission of instructor* Greek art from Neolithic and Hellenistic periods Roman art from the traditional founding to the end of the empire in the West

***585 (385 DL) Renaissance Art** (3 0) Cr 3 Alt S offered 1994 *Prereq Graduate classification permission of instructor* European art including painting sculpture architecture and crafts thirteenth through sixteenth centuries

***586 (386 DL) Baroque and Rococo Art** (3 0) Cr 3 Alt F offered 1994 *Prereq Graduate classification permission of instructor* European art including painting sculpture architecture and crafts seventeenth and eighteenth centuries

***587 (387 DL) Nineteenth Century Art** (3 0) Cr 3 Alt S offered 1995 *Prereq Graduate classification permission of instructor* European and American art and architecture from 1780 to 1900 focusing on the major monuments of western Europe Neo Classicism Romanticism Realism Impressionism and Post Impressionism

***589 (389 DL) Modern American Art** (3 0) Cr 3 S *Prereq Graduate classification permission of instructor* American art from 1870 to the present

590 Special Topics Cr arr F S SS *Prereq Bachelor s degree in art and/or design or evidence of satisfactory equivalency in specialized area Written approval of instructor and department chair on required form in advance of semester of enrollment*

***591 (391 DL) Modern European Art** (3 0) Cr 3 Alt F offered 1993 *Prereq Graduate classification permission of instructor* Painting sculpture architecture and crafts of Europe 1870 to the present

***594 (394 DL) Women in Art** (W S 594 394) (3 0) Cr 3 Alt S offered 1995 *Prereq Graduate classification permission of instructor* The lives careers and achievements of women artists and the related cultural environment from the Middle Ages to contemporary times in Europe and America The feminist movement beginning in the 1970s and specifically feminist issues in art that are becoming widespread in the artistic culture

595 Varieties of Postmodernism (3 0) Cr 3 F *Prereq Graduate classification permission of instructor* Survey of the visual arts and critical theory from the 1970s to the present focusing on the postmodern characteristics of pluralism eclecticism appropriation and deconstruction

***596 (396 DL) History of Photography** (3 0) Cr 3 Alt F offered 1994 *Prereq Graduate classification permission of instructor* Survey of the evolution of photography and photojournalism from the 1830s to the present seen from an art historical perspective emphasizing causative factors cultural influences and major masters and schools

Visual Studies (ArtVS)

Courses Primarily for Undergraduate Students

202 Calligraphy (0 6) Cr 3 F S *Prereq Art 108 and 130 or equivalent design/drawing coursework* Introduction to direct stroke letters for calligraphy Applied design applications

208 Color (0 6) Cr 3 F S *Prereq Art 108 or 130 or equivalent design/drawing coursework* Exploring the impact of changing visual relationships emphasizing color concepts Pigment mixing and interaction exercises study of various color systems

229 Design Through Photography I (2-4) Cr 3 F S Introduction to photography as a medium of design Techniques of camera use and dark room processes *Must have a camera with shutter Field trip* Field trip and materials fees

300 Sources of Visual Design (0 6) Cr 3 F *Prereq Art 109 230* Discussion and studio exercises to develop awareness of external and internal sources for design Materials fee

302 Intermediate Calligraphy (0 6) Cr 3 F *Prereq 202* Design with calligraphic alphabets Two dimensional and three-dimensional applications

***303 (503 DL) Calligraphic Alphabet Design** (0-6) Cr 3 S *Prereq 202* Use of a variety of tools for alphabet development Design applications including book arts

304 Papermaking (0-6) Cr 3 each time taken maximum of 6 Alt S offered 1994 *Prereq 6 credits in studio work* Investigation of papermaking as a creative forming process Three-dimensional applications Materials fee

***305 (505 DL) Two Dimensional Mixed Media** (0 6) Cr 3 each time taken maximum of 6 F *Prereq 12 credits in design and/or drawing* Exploration and application of various materials techniques and ideas Students required to attend selected exhibitions and/or lectures Materials fee

***306 (506 DL) Three Dimensional Mixed Media** (0 6) Cr 3 each time taken maximum of 6 Alt S offered 1993 *Prereq 12 credits in design and/or drawing* Exploration of three-dimensional forms including relief Presentation techniques Students required to attend selected exhibitions and/or lectures Materials fee

326 Introduction to Illustration (BPMI 326) (0-6) Cr 3 F *Prereq ArtDP 238* Application of painting drawing and image making techniques to communication Development of technical facilities in a variety of illustration media Review of the past and current state of illustration and the role of typography and its integration with illustration Introduction of camera ready and print production techniques Materials fee

327 Illustration as Communication and Interpretive Expression (BPMI 327) (0-6) Cr 3 S *Prereq 326* Studio problems in illustration covering editorial advertising and narrative expression Problem solving methodologies Materials fee

***329 (529 DL) Design Through Photography II** (0 6) Cr 3 each time taken maximum of 9 F S *Prereq 229 or JI MC 309 and 310 or equivalent photography course* Use of photography as a pliable medium of art and design Must have camera with adjustable shutter speeds and lens openings Field trip Field trip and materials fees

335 Three Dimensional Studio (Arch 335) (0-6) Cr 2 each time taken F S Investigation of basic sculptural media modeling in clay wood carving stone carving casting in plaster and metal welding and other constructing techniques

336 Biological Illustration Principles and Techniques (BPMI 336) (0-6) Cr 3 each time taken maximum of 6 F *Prereq 6 credits in art and design and 3 credits in the biological sciences* Studio basics and fundamentals of traditional biological rendering techniques Emphasis on tools and materials

337 Application of Biological Illustration Techniques (BPMI 337) (0 3) Cr 3 each time taken maximum of 6 S *Prereq 336* Rendering techniques applied to different types of biological subject matter including computer and airbrush applications Term project required

***408 (508 DL) Computer aided Art and Design** (0-6) Cr 3 each time taken maximum of 9 F S *Prereq Dsn S 201* Investigation of the computer and software as a pliant medium for art and design Emphasis on use as a tool for concept development alternative problem solving communication pathfinding and exploration of visual vocabulary

490 Independent Study Cr 1 to 6 each time taken F S SS *Prereq Written approval of instructor and department chair on required form in advance of semester of enrollment* Offered on a graded basis or a satisfactory fail basis Student must have completed related design coursework appropriate to planned independent study
A Two-Dimensional Media (materials fee)
B Three Dimensional Media (materials fee)
C *Calligraphy/Letterform Design*
D Computer Art and Design
E Illustration
G Photography (materials fee)
H Honors (materials fee)

493 Workshop Cr 1 to 3 each time taken SS *Prereq Evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered

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*See page 119 for information on dual listed courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***503 (303 DL) Calligraphic Alphabet Design** (0-6) Cr 3 S *Prereq Graduate classification permission of instructor* Use of a variety of tools for alphabet development Design applications including book arts

***505 (305 DL) Two Dimensional Mixed Media** (0 6) Cr 3 each time taken maximum of 6 F *Prereq 12 credits in design and/or drawing* Exploration and application of various materials techniques and ideas Students required to attend selected exhibitions and/or lectures Materials fee

***506 (306 DL) Three-Dimensional Mixed Media** (0-6 to 10) Cr 3 each time taken maximum of 6 Alt S offered 1993 *Prereq 12 credits in design and/or drawing* Exploration of three-dimensional forms including relief Presentation techniques Students required to attend selected exhibitions and/or lectures Materials fee

***508 (408 DL) Computer aided Art and Design** (0-6) Cr 3 each time taken maximum of 9 *Prereq Graduate classification permission of instructor* Investigation of the computer and software as a pliant medium for art and design Emphasis on use as a tool for concept development alternative problem solving communication pathfinding and exploration of visual vocabulary

***529 (329 DL) Photography Studio** (0-6) Cr 3 each time taken maximum of 9 F S *Prereq Graduate classification permission of instructor* Use of photography as a pliable medium of art and design Must have a camera with adjustable shutter speeds and lens openings Field trip Field trip and materials fees

590 Special Topics Cr arr F S SS *Prereq Bachelor s degree in art and/or design or evidence of satisfactory equivalency in specialized area Written approval of instructor and department chair*

on required form in advance of semester of enrollment

A Two-dimensional Media (materials fee)
B Three-dimensional Media (materials fee)
C Calligraphy/Letterform Design
D Computer Art and Design
G Photography (materials fee)
I Intermedia (materials fee)

593 Workshop Cr 1 to 3 each time taken SS *Prereq Graduate classification evidence of satisfactory experience in area of specialization* Intensive 2 to 4 week studio exploration Topics vary each time offered

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*See page 119 for information on dual-listed courses

Astronomy and Astrophysics

For description of courses see *Physics*

Bacteriology

See *Microbiology*

Biochemistry and Biophysics

Bernard J White Chair of Department

Professors Applequist, Atherly Beitz Fromm Graves Hammond Horowitz Metzler Nilsen-Hamilton Olson Robson Robyt Stromer B Thomas J Thomas Tipton White

Emeritus Professor Bremner

Associate Professors Buss Honzatko Huiatt Kostic Myers Tabatabai Thornburg

Assistant Professors Kintanar Nikolau

Undergraduate Study

The department offers majors in biochemistry or biophysics in the College of Liberal Arts and Sciences and a major in agricultural biochemistry for students in the College of Agriculture

Biochemists and biophysicists seek to understand life processes in terms of chemical and physical principles They conduct research in such areas as cell metabolism reproduction structure and function of enzymes membranes and hormones chemical basis of heredity muscle contraction nerve transmission and the design and evaluation of drugs for the treatment of disease Biochemistry and biophysics provide the basis for much of modern biotechnology There are many opportunities in universities and medical schools government laboratories and industry for men and women well trained in biochemistry or biophysics Students who meet the necessary high scholastic standards usually continue their studies in a graduate college medical school or veterinary medical school

Agricultural Biochemistry Major in the College of Agriculture

For the undergraduate curriculum leading to the degree bachelor of science, see *College of Agriculture Curricula* Agricultural biochemistry is recommended to students interested in advanced study or employment in areas of agriculture requiring strong preparation in biochemistry chemistry physics and mathematics or in preparation for the study of veterinary medicine

Biochemistry or Biophysics Majors in the College of Liberal Arts and Sciences

For the undergraduate curriculum leading to the degree bachelor of science see *Liberal Arts and Sciences Curriculum* Biochemistry and biophysics are recommended to students whose career interests involve advanced study or employment in biochemistry or biophysics, or in related areas of the biological or medical sciences

Undergraduate liberal arts and sciences majors in biochemistry usually have the following basic courses or their equivalents in their programs B B 101 102 320 411 461 or 551 501 502 (or 404 405) Chem 177 177L 178 210 (or 211) 331 332 333A or B 334A or B 321 322 322L Math 165 166 265 (or 266) Phys 221 222 Biol 201 201L (or 202L) 202 301 and a minimum of 6 credits of biological science courses from biology botany genetics microbiology and zoology Undergraduate research B B 499 is recommended

Undergraduate majors in biophysics usually include the following basic courses in their programs B B 101 461 or 551 Chem 177 177L 178 210 (or 211) 321 321L (or 322L or Phys 311) 322 331 332 Math 165 166 265 266 Phys 221 222 324 (or 321) and 232 or Com S 205 Biol 201 201L (or 202L) Biol 202 or Bot 207 and 9 additional credits in 300 or higher level courses in biochemistry biophysics biological sciences chemistry or physics B B 320 and Gen 330 (or Biol 301) are recommended in meeting this requirement for students preparing for careers in molecular biophysics Students wishing a strong preparation for graduate studies are advised to take further mathematics courses such as 385 and 465

These lists of courses should not be regarded as statements of fixed requirements or as complete outlines of the work necessary for the major They are given solely for the convenience of students or advisers who wish to estimate the amount of basic study that may be needed

Biochemistry and biophysics majors are advised to meet the College of Liberal Arts and Sciences foreign language requirement with courses in French German or Russian

See also the B S /M S program under *Graduate Study*

The department offers minors in biochemistry in both the College of Agriculture and the College of Liberal Arts and Sciences, which may be earned by credit in B B 404 405 311 (or 411) and 451 (or Chem 321) plus additional supporting courses in chemistry or biochemistry for a total of 15 credits

English proficiency requirement Majors in agricultural biochemistry must complete Engl 104 and 105 and one course in speech fundamentals with a grade of C or better and complete a communications intensive requirement equivalent to 3 credits from courses within the major Liberal arts and sciences majors are required to get a grade of C– or better in Engl 104 and 105 and one of the following (a) Engl 204 305 or 314 (b) a written report in B B 320 411 or 499

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in biochemistry and biophysics and with interdepartmental majors in genetics, MCDB (molecular, cellular and developmental biology) plant physiology and toxicology The department also participates in the interdepartmental program in immunobiology (see *Index*) Minor work is offered to students taking major work in other departments

Prerequisite to graduate work is a sound undergraduate background in chemistry mathematics, physics, and biology

All graduate students are required by the department to teach as part of their training for an advanced degree

Candidates for the degree doctor of philosophy must demonstrate a reading knowledge of one modern foreign language either by passing the Educational Testing Service examination or by passing a three-year secondary school course or a one-year college course in a modern foreign language with a minimum grade of C–

The department offers a B S /M S program in biochemistry that allows students to obtain both the B S and M S degrees in five years The program is open to students in the College of Liberal Arts and Sciences and in the College of Agriculture Students interested in this program should contact the department chair for details Application for admission to the Graduate College should be made near the end of the junior undergraduate (third) year Students would begin research for the M S thesis during the summer semester after their junior year and are eligible for research assistantships

Open to graduate students for minor credit only 404 405 411 420 451 461

Courses Primarily for Undergraduate Students

101 Introduction to Biochemical Activities (1-0) Cr 1 F Research activities career opportunities in biochemistry and biophysics and an introduction to the structure of biologically important compounds

102 Introduction to Biochemistry (0-2) Cr 1 S *Prereq 1 semester of chemistry* Fundamentals of biochemistry including biopolymers biocatalysis metabolism and biochemical experiments For majors and potential majors in biochemistry and biophysics

***221 Structure and Reactions in Biochemical Processes** (3-0) Cr 3 F *Prereq 1 semester of chemistry* Fundamentals necessary for an understanding of biochemical processes For students in agriculture Not acceptable for credit toward a major in biochemistry or biophysics

***301 Survey of Biochemistry** (3-0) Cr 3 S SS *Prereq Chem 231 or 331* A survey of biochemistry structure and function of amino acids proteins carbohydrates lipids and nucleic acids enzymology metabolism biosynthesis and selected topics Not acceptable for credit toward a major in biochemistry or biophysics

311 Biochemistry Laboratory (1 3) Cr 2 F S *Prereq Credit or enrollment in 301* Emphasis on isolation characterization and quantification of biological substances Not acceptable for credit toward a major in biochemistry or biophysics Materials fee

***320 The Chemistry of Life** (2 0) Cr 2 S *Prereq Chem 331* Chemical basis of selected aspects of enzymology metabolism and molecular biology For sophomore majors in biochemistry and biophysics open to others desiring a sophisticated introduction to biochemistry

***404 *405 Biochemistry** (3-0) Cr 3 each Yr *Prereq 404 Chem 332 405 404* A fundamental rigorous treatment for graduate and advanced undergraduate students in agricultural biological and nutritional sciences 404 Chemistry of amino acids proteins carbohydrates lipids vitamins and nucleotides enzymology metabolism of carbohydrates and lipids 405 Metabolism of amino acids and nucleotides lipid biosynthesis synthesis turnover and post synthetic modification of DNA RNA and proteins genetic code metabolic regulation selected topics

411 General Biochemical Research Techniques (1 6) Cr 3 F *Prereq 320 or credit or enrollment in 404 or 501 Chem 210 or 211* Introduction to laboratory techniques for studying biochemistry including chromatographic methods gel electrophoresis spectrophotometry radioisotopes enzyme purification enzyme kinetics and characterization of carbohydrates proteins lipids and nucleic acids Materials fee

***420 Physiological Chemistry** (4-0) Cr 4 F *Prereq Chem 332* Structure and function of proteins enzymology biological oxidation chemistry and metabolism of carbohydrates lipids amino acids and nucleic acids protein synthesis and the genetic code relationship of biochemistry to selected animal diseases Biochemistry of higher animals will be emphasized Not acceptable for credit toward a major in biochemistry or biophysics

451 Introduction to Physical Biochemistry (2 0) Cr 2 F *Prereq Chem 331 Phys 112 or 222 a previous course in calculus is helpful but not required* Selected topics in physical chemistry in the context of applications to problems in biology biochemistry and food sciences Not acceptable for credit toward a major in biochemistry or biophysics

461 Introduction to Biophysics (2 0) Cr 2 S *Prereq 451 or Chem 321 or Phys 304* Biological phenomena viewed as problems in physics Survey of selected topics such as bioenergetics muscle contraction nerve conduction vision and macromolecular behavior

490 Independent Study F S SS Cr arr *Prereq College of Agriculture junior or senior classification and permission of instructor a maximum of 6 credits of 490 may be applied toward graduation College of Liberal Arts and Sciences permission of instructor no more than 9 credits of B B 490 may be counted toward graduation*

499 Undergraduate Research F S SS Cr 1 to 5 each time taken *Prereq Permission of staff member with whom student proposes to work* Research under senior staff guidance

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*Credit for both 420 and 404 405 for both 320 and 301 or for both 221 and Chem 231 may not be applied toward graduation

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 502 General Biochemistry (4-0) Cr 4 each Yr *Prereq 501 Chem 210 or 211 332 and 322 502 501* Chemical composition of living matter and the chemistry of life processes 501 Chemical characterization of amino acids proteins carbohydrates lipids and nucleotides membranes muscle biochemistry enzymology and co-enzymes metabolism of carbohydrates biological oxidations 502 Metabolism of lipids membrane biochemistry hormones biosynthesis of DNA RNA and proteins genetic code gene regulation molecular immunology selected topics For graduate students in biochemistry and biophysics advanced undergraduates in biochemistry or chemistry and qualified students desiring a rigorous course

503 Bioinorganic Chemistry (Chem 503) See *Chemistry*

511 Topics in Experimental Biochemistry (1 6) Cr var 1-3 F S *Prereq Credit or enrollment in 404 or 501 Chem 210 or 211* Modules include protein chemistry isotopes in biochemistry DNA sequence analysis and site specific mutagenesis and other basic laboratory modules on specialized topics Taught as individual one credit modules Materials fee

520 Genetic Engineering (Gen 520) See *Genetics*

520L Genetic Engineering Laboratory (Gen 520L) See *Genetics*

521 Radiobiochemistry (2-6) Cr 2 S 8 weeks *Prereq Credit or enrollment in 404 or 501 and credit in Chem 210 or 211* A laboratory course in biochemical uses of radioisotopes Covers basic techniques for detecting and quantifying radioisotopes Also provides laboratory experience in such topics as radioimmunoassay isotope dilution radiolabeling of proteins and isotopic studies of enzyme action Materials fee

531 Structure and Reactivity of Biomolecules (3-0) Cr 1 F Five weeks *Prereq Chem 332* Special properties of reactive groups prevalent in biomolecules and reactions commonly encountered in biochemical studies A study of reaction types and mechanisms in biochemistry

541 Computational Biochemistry (1-0) Cr 1 F *Prereq Chem 322 Phys 222 Math166* Application of computers to problems in biochemistry

551 Molecular Biophysics (3-0) Cr 3 F *Prereq Math 166 Phys 112 permission of instructors* An examination of physical methods for the study of the molecular structure and organization of biological materials with emphasis on applications Spectroscopy hydrodynamic methods and X-ray diffraction

581 Seminar (1-0) Cr 1 F *Prereq Permission of instructor* Short presentations by students and discussion on assigned topics For entering graduate students

590 Special Topics F S SS Cr arr

Courses for Graduate Students, major or minor

607 Plant Biochemistry (MCDB 607) (3-0) Cr 3 Alt F offered 1994 *Thornburg Nikolau Prereq 405 or 502* Description of unique aspects of plant biochemistry including lipid metabolism cell wall structure secondary metabolism phytoalexin biosynthesis and plant defenses

615 Molecular Immunology (Gen 615 MCDB 615 MIPM 615) (3-0) Cr 3 Alt F offered 1993 *Prereq 405 or 502* Buss Current topics in molecular aspects of immunology T and B cell receptors major histocompatibility complex antibody structure immunosuppressive drugs and viruses intracellular signalling pathways leading to expression of genes that control and activate immune function

622 Carbohydrate Chemistry (2-0) Cr 2 Alt S offered 1994 Robyt *Prereq 404 or 501* Structure occurrence properties function and chemical and enzymatic modifications of monosaccharides oligosaccharides polysaccharides and glycoproteins

632 Kinetics of Enzyme Action (2-0) Cr 1 or 2 8 or 16 weeks Alt S offered 1995 Fromm *Prereq 501* The one-credit version stresses the fundamentals of enzyme kinetics Topics include integrated rate equations methods for deriving initial rate equations inhibition product effects and methods for verifying kinetic mechanisms The two credit version covers the same material plus additional topics such as allostery hysteresis isotope effects and complex kinetic mechanisms

642 Mechanisms of Enzymatic Catalysis (2-0) Cr 1 First 8 weeks of semester Alt F offered 1993 Metzler *Prereq 404 420 or 501* The chemical basis of enzymatic catalysis with emphasis on mechanisms of substrate recognition general acid base catalysis and stereoelectronic factors

643 Vitamins and Coenzymes (2 0) Cr 1 Second 8 weeks Alt F offered 1993 Metzler *Prereq 404 420 or 501* Chemistry and function of vitamins coenzymes and prosthetic groups of enzymes

645 Hormones and Growth Factors (MCDB 645) (3 0) Cr 3 Alt S offered 1995 Beitz Nilsen Hamilton *Prereq 420 405 or 502* Advanced topics in regulation of metabolism with emphasis on important regulatory molecules and mechanisms of enzyme and gene regulation by hormones and growth factors

650 Biochemical Thermodynamics (2 0) Cr 2 Offered every third year next offered S 1995 Applequist *Prereq Chem 321* Biochemical phenomena such as metabolism coupled reactions denaturation of macromolecules cooperativity and membrane phenomena studied in the framework of thermodynamic principles

652 Protein Chemistry—Chemical Methods (2-0) Cr 1 8 weeks Alt S offered 1994 Graves *Prereq 404 or 501* Chemical reactions as a means of determining protein structure and biological function

653 Protein Chemistry—Physical Methods (2 0) Cr 1 8 weeks Alt S offered 1994 Staff *Prereq 404 or 501* Application of physical methods to protein structure and biological function

670 Molecular Biology of Muscle (An S 670) (3 0) Cr 3 Alt F offered 1994 Huiatt Robson Stromer *Prereq 405 420 or 502* Ultrastructure of muscle chemistry structure function and molecular biology of muscle proteins Molecular aspects of muscle contraction development and turnover Cytoskeletal proteins and dynamics

675 Nucleic Acid Structure and Function (Gen 675 MCDB 675) (2-0) Cr 2 Alt F offered 1993 *Prereq 405 or 502* Horowitz Properties of nucleic acids relationship of nucleic acid structure to function Chemistry of nucleotides the chemical reactivity of nucleic acids analytical and separation methods nucleases sequence determination synthesis of specific genes nucleoproteins

681 Advanced Seminar Cr 1 F S *Prereq Permission of instructor* Student presentations

682 Departmental Seminar Cr R F S *Prereq Permission of instructor* Staff and visitor presentations

696 Seminar in Plant Physiology and Molecular Biology (Agron 696 Bot 696 For 696 Gen 696 Hort 696) See *Botany*

698 Seminar in Molecular Cellular and Developmental Biology (MCDB 698) See *Molecular Cellular and Developmental Biology*

699 Research *Prereq Permission of instructor*

Biological/Premedical Illustration (BPMI)

(Interdepartmental Undergraduate Program)

Advisory Committee Warren D Dolphin Chair Dean Biechler Arthur C Croyle Richard Heggen Harry Horner Jean Lassila student member

Undergraduate Study

The interdepartmental undergraduate BPMI major is designed for students who want to combine their interests and aptitudes in science and art Based on the concept of communicating science through art the major prepares students for careers in biological illustration or for graduate education in medical illustration elsewhere Graduates enter fields such as biocommunications environmental display design free-lance illustration museum display design and various careers in the publishing industry

Entrance into the BPMI program is by application to the BPMI Advisory Committee Eligibility is based on an academic standard of at least 2 00 CGPA on 30 credits of university level work and a consideration of artistic ability as demonstrated through submission of a portfolio of representative drawings or other art work Freshman and transfer students usually declare preprofessional health programs (PHP) as their major while satisfying the conditions for entrance into the major although other majors can be declared

To earn the B A degree offered by the College of Liberal Arts and Sciences students must complete the general education requirements in that college and take 42 credits in design and 32 credits in the biological sciences Design courses include Art 130 and 230 ArtDP 233 238 and 330 BPMI 326 327 336 and 337 Dsn S 201 and JI MC 309 and 310 or ArtVS 229 plus 9 credits chosen from a list of approved upper level courses in art and design Biological science courses include Biol 102 201 201L 202 202L Bot 306 or 404 or 505 Zool 155 320 and at least 12 credits chosen from a list of approved biological science courses Students must earn a grade of C– or better in all art and science courses included in the major and must earn an overall GPA of 2 00 in both categories A brochure is available that gives a detailed listing of the requirements

Students in BPMI must complete a senior project or an internship experience in which they design and produce artwork that is suitable for publication or public display

A minor in biological illustration is offered A minimum of 17 credits must be taken including 8 credits in biological science courses and 9 credits in art and design courses The biological sciences must include Biol 201 201L 202 202L The art and design courses must include ArtVS 336 and 337 and ArtDP 430 For more information contact the chair of the BPMI Advisory Committee in 201 Bessey Hall

Courses Primarily for Undergraduate Students

326 Introduction to Illustration (ArtVS 326) See *Art and Design Visual Studies*

327 Illustration as Communication and Interpretive Expression (ArtVS 327) See *Art and Design Visual Studies*

336 Biological Illustration Principles and Techniques (ArtVS 336) (0-6) Cr 3 each time taken maximum of 6 F *Prereq 6 credits in art and design and 3 credits in biological sciences* Studio basics and fundamentals of traditional biological rendering techniques Emphasis on tools and materials

337 Application of Biological Illustration Techniques (ArtVS 337) (0-6) Cr 3 Cr 3 each time taken maximum of 6 S *Prereq 336* Rendering techniques applied to different types of biological subject matter including computer and airbrush applications Term project required

490 Independent Study Cr 1 to 3 each time taken maximum of 3 *Prereq Written approval of instructor and advisory committee chair on required form in advance of semester of enrollment* Offered on a satisfactory fail basis only

493 Workshop Cr 1 to 3 each time taken Intensive exploration of illustration techniques in a studio or field setting

498 Illustration Internship Cr 1 to 6 each time taken maximum of 6 *Prereq Junior or senior classification in BPMI written approval of supervising instructor and advisory committee chair on required form in advance of semester of enrollment* Offered on a satisfactory fail basis only

Biology

Warren D Dolphin Program Executive Officer

The biological sciences at Iowa State University are organized into 20 departments and programs These can be grouped into the basic sciences agricultural sciences and veterinary sciences Well over 200 faculty consider themselves life scientists and most teach courses at the undergraduate and graduate levels Such a large faculty group provides many opportunities for students to learn from some of the national leaders in biological research and teaching and to participate in exciting meaningful research projects that explore the frontiers in the life sciences Few other universities have such a wealth of faculty expertise available to undergraduate students

Biology is not a department at Iowa State University It is an interdepartmental undergraduate major that allows students to integrate knowledge from several life science disciplines into a coherent broadly based undergraduate program of study Students interested in specific areas of the basic biological sciences may declare majors in disciplines such as animal ecology biochemistry botany entomology genetics microbiology and zoology Although the required courses for each of these majors differ in significant ways they are similar during the first two years In particular all require freshman biology and chemistry most require calculus and organic chemistry and all require credits in general education courses As a result and with proper planning a student is able to transfer from one basic biological science major to another without serious difficulty any time during the first two years For detailed requirements see the catalog entries under the particular majors

The biology major is particularly well suited for those who plan to teach biology who wish to enter government or industrial employment in the health or environmental professions or who prefer educational breadth as an end in itself A bachelor s degree in biology provides excellent preparation for graduate study in many biological disciplines and for entrance into various professional schools such as human medicine physical therapy or veterinary medicine Students with particular interests can combine biology with a second major in another area such as environmental studies a foreign language journalism or political science

Undergraduate Study

Of the courses taught by the biology program Biol 109 is a general presentation of selected biological topics designed primarily for students not majoring in the basic biological sciences Biol 110 and its associated lab is a course for majors under the old (pre-1993) curriculum and is being phased out It will be taught for the last time in fall 1993

Beginning in fall 1993 a new unified biology core sequence will be instituted to serve the various majors in the life sciences This core consists of four integrated courses that explore the basic principles of the biological sciences The first year (Biol 201 202) provides a broad introduction to the nature of life The second year (Biol 301 302) provides an integrated foundation in the principles of genetics cell biology and elementary biochemistry

A detailed description of the courses required in the biology major is available in 201 Bessey Hall Biology majors take a minimum of 40 credits in the biological sciences including the following courses Biol 102 201 201L 202 202L 301 301L 302 302L 312 and 403 plus 18 additional credits in approved life science courses numbered 300 or above These advanced courses are taught by faculty in the biological science departments previously listed Courses beyond the core must be chosen from at least two departments so that the student s program of study reflects breadth of preparation Those wishing to specialize should consider taking Biol 490 (Independent Study) in order to gain research experience prior to graduation A maximum of 6 credits in Biol 490 may be applied toward the advanced course requirement A grade of C– or better is required in all biological science courses applied to the major and the cumulative average in the major must be at least a C

Supporting course requirements include 16 credits in chemistry to include two semesters of general chemistry with labs and at least one semester of organic chemistry with lab after demonstrating competence in algebra and trigonometry two semesters of calculus or statistics chosen from a list of approved courses available in 201 Bessey Hall and a two semester sequence in general physics

Because biology is a major in the College of Liberal Arts and Sciences students must fulfill the foreign language and general education requirements in that college Biology also requires that students earn a minimum grade of C in both English 104 and 105 or equivalent composition courses and in one advanced writing course numbered Engl 302 through 316

In addition to courses offered on campus courses in field and aquatic biology are offered at the Iowa Lakeside Laboratory Courses in marine biology are available at the Gulf Coast Research Laboratory in Mississippi See entries under *Animal Ecology Biology Botany Microbiology* and *Zoology and Genetics* for descriptions of these courses

Biology majors seeking certification to teach biology in secondary schools must meet requirements of the College of Education as well as those of the biology program In addition they must apply formally for admission to the teacher education program See *Index Teacher Education and Licensure*

The program offers a minor in biology which may be earned by credit in Biol 201 201L 202 202L 301 301L 302 302L and 3 credits in courses numbered 300 or above from a list available in the Biology Office A minor or a double major in biology with a

major in another basic biological science is *not permitted. Likewise, a minor* in another basic biological science with a major in biology is not permitted

Graduate Study

Biology is only an undergraduate major Persons interested in graduate study in the *biological sciences* should apply directly to one of the life science departments Interdepartmental graduate offerings in ecology and evolutionary biology (EEB) *genetics molecular cellular* and developmental biology (MCDB) neurobiology toxicology general graduate studies (biological sciences) immunobiology biomedical *engineering and water resources* are also available (See *Index*)

A non-thesis master s degree in general graduate studies (biological sciences) has been established particularly for teachers who wish to broaden and update their formal training in biology

Courses Primarily for Undergraduate Students

102 Opportunities in Biology (2-0) Cr R F First 8 weeks Introduction to the scope of the areas of study in the biological sciences and discussion of professional opportunities Required of first year biology majors

[a]109 Introductory Biology (3-0) Cr 3 F S SS Life considered at cellular organism and population levels Function and diversity of the living world Presentation of basic biological principles as well as topics and issues of current human interest Non majors only

[a]110 Principles of Biology (3-0) Cr 3 F 1993 only *Prereq High school chemistry and credit or enrollment in Chem 163 or 177 recommended* Organization metabolism and reproduction of living systems at the molecular cellular and population levels Includes growth reproduction inheritance evolution ecosystems communities and populations To be taken only by students who are following the old curriculum requirements in the 1991-93 catalog

110L Laboratory in General Biology (0-3) Cr 1 F 1993 only *Prereq Credit or enrollment in 110 concurrent enrollment recommended* Experiments illustrating concepts covered in Biol 110 Materials fee

[a]201 [b]202 Principles of Biology (3-0) Cr 3 each F S *Prereq 201 High school chemistry and credit or enrollment in Chem 163 or 177 202 201* Introduction to the nature of life including the cellular basis of life energy relationships the nature of heredity evolution form and function of microbial plant and animal life and principles of ecology

201L [b]202L Principles of Biology Laboratory (0-3) Cr 1 each F S *Prereq 201L Credit or enrollment in 201 202L credit or enrollment in 202* Laboratory to accompany 201 and 202 Materials fee

301 Principles of Genetics (Gen 301) (3-0) Cr 3 F S First offered fall 1994 *Prereq 202 credit or enrollment in organic chemistry* Introduction to the principles of classical and modern molecular genetics of plants animals and bacteria Recombination structure and replication of DNA gene expression cloning quantitative and population genetics

[c]301L Genetics Laboratory (Gen 301L) (0 3) Cr 1 F S First offered fall 1994 *Prereq Credit or enrollment in 301* Laboratory to accompany 301 Materials fee

[c]302 Molecular Cell Biology and Biochemistry (3-0) Cr 3 F S First offered spring 1995 *Prereq 301 Integration of elementary principles of* metabolism bioenergetics cell structure and function to develop a molecular view of how the cell works

302L Molecular Cell Biology and Biochemistry Laboratory (0-3) Cr 1 F S First offered spring 1995 *Prereq Credit or enrollment in 302* Laboratory to accompany 302 Materials fee

312 Ecology (A Ecl 312) (2 3) Cr 3 F SS *Prereq 202L* Fundamental concepts and principles of ecology dealing with ecosystems communities and populations Laboratory and field exercises examine ecological principles and methods as well as illustrate habitats Materials fee

374 Insects in Human and Animal Health (Ent 374) *See Entomology*

403 Biological Evolution (Zool 403) (3 0) Cr 3 F S *Prereq credit or enrollment in 301* The mechanisms of evolution Topics in microevolution population genetics *natural selection genetic* variation and adaptation Macroevolution speciation extinction phylogeny and major evolutionary patterns

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in biology and permission of instructor* See also 490 offerings in biological science departments No more than 9 credits in Biol 490 may be counted toward graduation

495 Undergraduate seminar Cr 1 each time taken F *Prereq 15 credits in biological science* Current issues in biology investigated Graduate *school and employment* opportunities discussed Practice given in résumé writing and interview techniques

Courses Offered at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi

Written permission of the coordinator for the Gulf Coast Research Laboratory 201 Bessey Hall Iowa State University Ames Iowa 50011 is prerequisite to all courses offered at the Gulf Coast Laboratory Numbers in parentheses beginning with MAR are GCRL numbers

252G (MAR 301) Marine Biology Cr 3 SS *Prereq 8 semester hours of biological sciences* A general introduction to marine biology with emphasis on local fauna and flora

252LG (MAR 301L) Marine Biology Lab Cr 2 SS Lab to accompany 252G

450G Marine Science for Teachers Cr 2 or 4 SS *Prereq Permission of instructor* Designed to acquaint teachers with marine and coastal environments

450LG Marine Science for Teachers Lab Cr 1 or 2 Lab to accompany 450G

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[a]Students may receive graduation credit for no more than one of the following 109 110 201

[b]Students may receive graduation credit for no *more than one of the following 202 and 202L* Zool 206

[c]Students may receive graduation credit for no more than one of the folllowing 301 and 301L Gen *260 Gen 330 and Gen 330L*

[d]Students may receive graduation credit for no more than one of the following 302 Zool 325

Biomedical Engineering

(Interdepartmental Graduate Program)

Supervisory Committee M H Greer associate professor in charge E B Bartlett W H Brockman D L Carlson R L Engen A B Flateau, R T Greer J C Huston Srdija Jeftinija T D McGee P E Patterson P T Pearson T R Rogge R C Seagrave C S Swift R J Weber D F Young

The biomedical engineering program (B M E) is interdisciplinary in scope and is sponsored jointly by the colleges of Engineering and Veterinary Medicine Biomedical engineers are concerned with the application of engineering concepts and analytical techniques to biological and medical problems They are interested in developing new concepts instrumentation for measurements of living systems and materials for use in living systems In addition they seek to understand those phenomena of living systems which have *functional capabilities* desirable in the design of physical systems Following completion of biomedical engineering training they engage in research careers in the various fields of *biomedicine and engineering They may work* on multidisciplinary teams in industrial governmental or academic research institutes Individuals with this training can correlate and adapt engineering *principles to* the problems of medicine and biology utilize engineering knowledge to increase understanding of the functions of biological systems and develop new quantitative methods for scientific investigation diagnosis and therapy

Undergraduate Study

A curriculum leading to a bachelor s degree in biomedical engineering is not offered Undergraduate students *planning graduate* study are encouraged to develop knowledge in subjects prerequisite to biomedical engineering courses For example undergraduate students majoring in engineering physics or mathematics are encouraged to elect courses in organic chemistry biochemistry and biology Undergraduate students majoring in life science areas should prepare for graduate study by electing courses in mathematics engineering and physics

Graduate Study

Work is offered for the degrees master of science and doctor of philosophy with major in biomedical engineering and minor work for students taking major work in other areas Prerequisite to major and minor work in the interdepartmental program of biomedical engineering is an undergraduate degree in one of the fields of engineering life sciences physical sciences or a professional degree in one of the fields of medicine

The program of formal courses taken by students is oriented toward developing proficiency in research in the interdisciplinary field or in utilizing biomedical principles in clinical situations Selected background and advanced courses from related disciplines are taken in conjunction with appropriate biomedical engineering courses The program of formal courses varies depending upon the background and interests of the student and is determined in consultation with the student s committee

Course Primarily for Undergraduate Students

401 Scope of Biomedical Engineering (1-0) Cr 0 5 F 8 weeks Topics characteristic of career activities in biomedical engineering For undergraduate students who wish to become familiar with the field of biomedical engineering Offered on a satisfactory fail basis only

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

506 Integrated Circuit Applications in Biomedical Engineering (E E 506) (1 2) Cr 2 S *Prereq E E 441* Analog signal measurement generation and processing using operational amplifiers and other linear ICs

507 Biomedical Instrumentation (E E 507) (3-0) Cr 3 F *Prereq E E 206 or 441 credit or enrollment in B M E 525* Characteristics of bioelectric signals pressure signals transducers Biological data acquisition Electrical safety

508 Biomedical Data Processing (E E 508) (2-0) Cr 2 S *Prereq E E 206 or 441* Digital data acquisition systems used in biomedical research hardware data reduction algorithms digital filters

520 Biomechanics (E M 520) (3-0) Cr 3 Alt F offered 1993 *Prereq Phys 111 or 221 Math 265* For students with interests in the life sciences who wish to obtain background in applied mechanics Topics include equilibrium vibratory motion stress and deformation material properties flow of fluids dimensional analysis and modeling of biological systems Illustrative examples taken from biology and medicine

525 Anatomy and Physiology for Biomedical Engineers (2 2) Cr 3 F *Prereq Phys 222* Microscopic and gross anatomy with emphasis on functional relationships and engineering design

540 Biothermodynamics and Transport Phenomena (Ch E 540) (3-0) Cr 3 S *Prereq Ch E 210 Math 266 Phys 222* The principles of thermodynamics and transport phenomena applied to the study of physiology and the design and operation of artificial organs and life support systems

545 Electrophysiology (VPP 545) (2-0) Cr 2 S *Prereq 551 Math 176 Phys 222* Electrical events in living systems

551 551L 552 Advanced Vertebrate Physiology (V P P 551 551L 552 Zool 551 551L 552) See *Veterinary Physiology and Pharmacology*

555 Biomedical Fluid Mechanics (E M 555) (3-0) Cr 3 Alt F offered 1994 *Prereq 520* Application of principles and concepts of fluid mechanics to problems in biology and medicine Hemodynamic characteristics of the circulation rheology of blood flow in the microcirculation flow in the large arteries and the respiratory system

575 Simulation of Biological Systems (3 0) Cr 3 F *Prereq 525 540* Development of mathematical models for living systems including control systems population dynamics cardiovascular and respiratory systems and anesthesia delivery systems

580 Biomaterials (E M 580 M S E 580) (3-0) Cr 3 S *Prereq M S E 201* Presentation of the basic chemical and physical properties of biomaterials as they are related to their manipulation by the engineer for incorporation into living systems Role of microstructure properties in the choice of biomaterials and design of artificial organs implants and prostheses

590 Special Topics Cr 1 to 5 as arranged Investigation of problems of special interest in biomedical engineering

Courses for Graduate Students, major or minor

615 Experimental Surgery (2-6) Cr 4 Alt SS offered 1995 *Prereq 525* Advanced surgical procedures for quantitative studies in biomedical engineering

690 Advanced Topics Cr 1 to 5 as arranged
A Instrumentation
B Simulation
C Transport Phenomena
D Biomaterials
E Information Processing

699 Research

Botany

Lois Hattery Tiffany Chair of Department

Professors Farrar Glenn-Lewin Horner Knaphus LaMotte Lersten Stewart Tiffany van der Valk

Emeritus Professors Dodd Isely Pohl Smith Swenson

Associate Professors Crumpton Jurik Spalding Wendel

Assistant Professors Clark Colbert Moloney Raich Rodermel Wallace Wurtele

Undergraduate Study

For undergraduate curriculum in liberal arts and sciences major in botany see *Liberal Arts and Sciences Curriculum*

The department offers broad study opportunity in many basic and applied aspects of plant biology Undergraduate programs are adapted to students of varied interests preparing them for a wide range of science related occupations, including biology teaching conservation and outdoor recreation activities and research development and sales programs of industry and agriculture The major offers excellent preparation for graduate study in botany and related biological sciences or in such applied disciplines as agronomy forestry horticulture and plant pathology

Botany is one of the basic biological sciences Undergraduates majoring in botany must therefore obtain a general biological foundation by taking courses in the biology program (see *Biology Cross-Disciplinary Program)* Botany faculty are involved in both the organization and teaching of biology courses thus biology and botany are integrated for the benefit of the student

In addition to the basic liberal arts and sciences requirements botany majors must also complete

1 Bot 207 399 and one course from each of the following areas of botany

Physiology-molecular biology (310 320 or 529)
Anatomy (404 or 553)
Taxonomy-morphology (306 367L 406 505 or 558)
Ecology (364 484 500 or 564)

2 Biol 201 201L 202, 202L and 403

3 Biol 301 302L

4 Phys 106 (or 111 and 112)

5 One semester of general chemistry with lab and one semester of organic chemistry with lab

6 B B 301 Biol 302

7 *Math 140 141

8 English proficiency requirement A minimum of C– in both English 104 and 105 or equivalent and in an advanced writing course or a department writing exam

*Students may use the ISU Math Placement Test to satisfy this requirement Math 140 and 141 do not satisfy the LAS group requirement in math

The department recommends one or more courses in zoology animal ecology or microbiology Qualified students are encouraged to enrich their program through an independent study or research project (Bot 490) under the guidance of a faculty member Courses at the Iowa Lakeside Laboratory the Gulf Coast Research Laboratory or other field laboratories are also recommended

The courses listed here are intended as a guide to students and their advisers in planning a program best fitted to individual needs

Biotechnology Emphasis A student preparing for a career in biotechnology should gain experience in laboratory techniques The following options in the botany major requirements are recommended Bot 320 Chem 177 177L 331 332 Biol 301 and B B 404 405 (in lieu of 301 or Biol 302) The following additional courses are recommended B B 411 Chem 211 MIPM 202 402 402L and laboratory experience in plant cell and tissue culture Independent study (Bot 490) an internship in an industrial or governmental laboratory or work experience in a research laboratory is strongly recommended

Ecology Emphasis The following courses in addition to the botany major core are recommended for students preparing for careers in ecology Biol 312 Bot 484 for those interested in aquatic ecology also Bot 364 500 564 A Ecl 410 for those interested in terrestrial ecology also Bot 582 583 584 588 and field experience The following are also strongly recommended courses in calculus and statistics Independent Study (Bot 490) an internship with a county state or federal agency a field course at a summer field station such as Lakeside Laboratory or work experience in a research laboratory

Teacher Licensure Botany majors seeking licensure to teach biology in secondary schools must meet requirements of the College of Liberal Arts and Sciences and the College of Education as well as those of the botany major In addition they must apply formally for admission to the teacher education program See *Index Teacher Education and Licensure*

Botany Minor The department offers a minor in botany which may be earned by completion of 15 or more credits in botany courses with at least 6 credits in courses numbered 300 or above and earned at ISU with a grade of C or higher Credit toward a minor is not allowed for more than one of the following Bot 102 207 307

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with a major in botany and minor work for students majoring in other departments Within the botany major one of the following areas of specialization may be designated aquatic and wetland ecology cytology ecology morphology mycology physiology and molecular biology or systematics and evolution

The department also participates in the interdepartmental majors in ecology and evolutionary biology molecular cellular and

developmental biology plant physiology toxicology and water resources (See *Index*)

Prospective graduate students need a sound background in the physical biological and mathematical sciences and English The department requires submission of Graduate Record Examination aptitude test scores

Open to graduate students for graduate minor credit only 320 404 406 484

Courses Primarily for Undergraduate Students

102 Biology of Plants (2-4) Cr 2 F S SS 8 weeks Function structure development and evolution of plants *Primarily for students who do not plan to take Bot 207* Materials fee

202 Field Botany (2-4) Cr 2 F S SS 8 weeks Field and laboratory studies of plants in various local habitats Includes trees shrubs flowering plants and other green plants lichens and fungi Not recommended for students with professional interest in plant science Field trips Field trip fee

207 General Botany (3-3) Cr 4 F S *Prereq Biol 109 or 110 or 201* Structure function development origins and ecology of plants Reproduction and evolutionary relationships of algae fungi bryophytes seedless vascular plants and seed plants Materials fee

256 Dendrology (For 256) (1-6) Cr 3 F *Prereq 207 or Biol 202* Farrar Taxonomy morphology and ecology of North American species of woody plants of importance in timber production and wildlife food and cover Field trips Field trip fee

304 Plants and Civilization (2 2) Cr 3 Alt F offered 1995 *Prereq Credit or enrollment in Biol 109 or 201 or Bot 102* Wendel The role of plants in the origin diffusion and historical evolution of *human cultures Plants and present needs* food industrial products medicines Plants and the future food energy and the changing environment

306 Plant Taxonomy (2-4) Cr 4 S *Prereq 207 or Biol 110 or 201* Wendel Principles of plant classification survey of flowering plant families identification and field study of local plants Field trips Field trip fee

307 Fundamentals of Botany (2 2) Cr 3 S *Prereq Chem 163 or 167* Knaphus Study of plant structure and function with emphasis on physiology of flowering plants

***310 Plant Physiology** (2 3) Cr 3 F *Prereq 102 or 207 or Biol 202L Chem 163L* Stewart Basic physiological processes with emphasis on those processes which limit the production of food and other economically important plant products

***320 Plant Physiology** (3 3) Cr 4 S *Prereq 207 or Biol 202L Chem 331 or B B 301 Phys 111 Math 141 recommended* Spalding Application of physical and biological principles to the understanding of plant processes involved in assimilation metabolism and regulation of growth and development

364 Biology of Aquatic Plants and Algae (2 2) Cr 3 F *Prereq Two courses in biological science* Crumpton Introduction to algae and aquatic vascular plants with emphasis on ecological relationships in lakes rivers and wetlands Materials fee

399 Undergraduate Seminar (1 0) Cr 1 each time taken S *Prereq Junior classification and 8 credits in botany* Knaphus Meetings of students and staff to discuss topics of current interest in plant science

404 Plant Anatomy (2 3) Cr 3 F *Prereq 207 or Biol 202L 306 recommended* Lersten Characteristics of cell and tissue types in vascular plants Anatomy of developing and mature stems roots and leaves including secondary (woody) growth Introduction to the special anatomy of flowers and seeds

406 Principles of Mycology (MIPM 406) (2 3) Cr 3 F *Prereq 10 credits in biological sciences* Tiffany Morphology taxonomy and ecology of fungi their relation to agriculture and industry

484 Plant Ecology (3-0) Cr 3 S *Prereq Biol 312* Principles of plant population community ecosystem and landscape ecology

490 Independent Study Cr 1 to 3 each time taken *Prereq 7 credits in botany permission of instructor No more than 9 credits of 490 may be counted toward a degree in botany*
A Plant Physiology and Molecular Biology
B Morphology
D Mycology
E Systematics and Evolution
F Plant Ecology
H Honors
J Cytology
K Aquatic and Wetland Ecology

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*Credit for both 310 and 320 may not be applied toward graduation

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Ecology of Aquatic and Wetland Microorganisms (MIPM 500) (2 2) Cr 3 S *Prereq 10 credits in biological sciences* Crumpton Introduction to major groups of autotrophic and heterotrophic microorganisms and their roles in aquatic systems Environmental factors affecting growth and reproduction

503 Introductory Microtechnique (0-3) Cr 1 Alt F offered 1994 *Prereq Credit or enrollment in 404* Lersten Instruction in making freehand paraffin and resin sections for microscopic examinations and preparation of leaf clearings and wood macerations

505 Plant Diversity and Evolution (2 6) Cr 4 Alt S *offered 1995 Prereq 10 credits in biological sciences* Farrar Modern concepts of plant phylogeny from the origin of land plants through the origin of angiosperms with emphasis on morphology reproduction and evolutionary trends in bryophytes pteridophytes and gymnosperms

511 Plant Nutrition and Water Relations (2-0) Cr 2 S *Prereq B B 451* Stewart Mineral nutrition ion and water relations translocation in vascular plants and physiological responses to abiotic stresses

512 Plant Growth Regulation (MCDB 512) (2-0) Cr 2 S *Prereq 320 or a course in developmental biology B B 404 405 or Gen 520* Wurtele Plant growth and development and its molecular regulation Hormone biosynthesis metabolism and action

513 Plant Metabolism (2 0) Cr 2 F *Prereq 320 Phys 111 Chem 331 one semester of biochemistry recommended* Stewart Spalding Photosynthesis respiration and other aspects of plant metabolism

529 Plant Cell Biology (MCDB 529) (2-0) Cr 2 Alt S offered 1995 *Prereq 310 or 320 or Zool 325 B B 405 or Biol 301 or Gen 330* Rodermel Organization function and development of plant cells and subcellular structures

545 Plant Molecular Biology (MCDB 545) (2-0) Cr 2 F *Prereq B B 405 or Gen 420 Gen 520 recommended* Colbert Organization and function of plant nuclear and organelle DNA regulation of gene expression Methods of generating novel genetic variation

552 Pteridology (1 3) Cr 2 Alt SS offered 1994 *Prereq 10 credits in biological sciences* Farrar Morphology taxonomy and ecology of the lower vascular plants with emphasis on ferns Field trip fee

553 Sexual Reproduction in Flowering Plants (2-0) Cr 2 Alt S offered 1994 *Prereq 10 credits in biological sciences including Bot 306* Lersten Structural and functional aspects of stamen/pollen and ovule/embryo sac development pollination pollen tube growth and fertilization embryo and endosperm development

558 Paleobotany (1-3) Cr 2 Alt S offered 1994 8 weeks *Prereq 10 credits in biological sciences* Farrar Introduction to morphology identification and phylogeny of fossil plants from Pre-Cambrian to present

559L Field Biology of Bryophytes and Pteridophytes (See list of courses offered at *Iowa Lakeside Laboratory next page*)

564 Wetland Ecology (2 3) Cr 3 F *Prereq Graduate classification* van der Valk Ecology classification creation and restoration and management of wetlands Emphasis on North American temperate wetlands Laboratories stress collection and identification of aquatic vascular plants Weekend field trips Field trip fee

575 Field Mycology (2-6) Cr 4 each time taken SS offered 1994 (SS II 1994 Lakeside Lab) *Prereq 5 credits in botany* Tiffany Collection and identification of fungi and relation of their occurrence to environmental factors Preparation and utilization of mycological exsiccati May be taken at Iowa Lakeside Laboratory with written permission of instructor Field trips

582 Physiological Ecology of Plants (3 0) Cr 3 Alt S offered 1994 *Prereq 320 484 recommended* Jurik The nature of adaptations to physical and biotic environments Photosynthesis water relations energy balance nutrient relations and other physiological bases of plant growth distribution and abundance

583 Techniques in Physiological Ecology (0-3) Cr 1 Alt S offered 1994 *Prereq Credit or enrollment in 582* Jurik *Laboratory and field* approaches to plant water relations photosynthesis energy balance and growth Modern techniques of data acquisition and analysis *Field trips Field trip* fee

584 Communities and Ecosystems (3 0) Cr 3 F *Prereq 484* Survey of the structure and function of major terrestrial communities Food webs energy flows and controls over community structure and composition Water nutrient and carbon fluxes in terrestrial ecosystems The effects of humans on ecosystem properties

585 Advanced Field Ecology (0-6) Cr 2 each time taken S *Prereq Graduate classification* Weekend and extended field trips to various vegetation types with emphasis on field problems Report required Field trip fee

588 Plant Population Ecology (2 3) Cr 3 Alt S offered 1994 *Prereq 484 Stat 401 and calculus recommended* Theory of population dynamics with an emphasis on plants Demography competition regulation genetic structure and spatial interactions of populations

590 Special Topics Cr 1 to 3 each time taken *Prereq 10 credits in botany permission of instructor*
A Plant Physiology and Molecular Biology
B Morphology
D Mycology
E Systematics and Evolution
F Plant Ecology
J Cytology
K Aquatic and Wetland Ecology

595 Agrostology (2 3) Cr 3 Alt F offered 1994 *Prereq 306* Clark Structure identification classification phylogeny and economic aspects of grasses and related families

596 Advanced Plant Systematics (2-6) Cr 4 Alt F offered 1993 *Prereq 306 and permission of instructor* Clark Wallace Wendel Principles and history of plant classification evaluation of classification systems theory and problems processes of plant speciation sources and interpretation of systematic data examination of research methods and their applications plant nomenclature

599 Creative Component Cr arr Research toward nonthesis master s degree

Courses for Graduate Students, major or minor

641, 642 General Mycology (MIPM 641 642) (2-6) Cr 4 each Yr *Prereq PI P 407* Tiffany Taxonomy morphology ecology and phylogeny of slime molds and fungi (mastigomycetes zygomycetes ascomycetes basidiomycetes and fungi imperfecti) Materials fee

679 Light Microscopy (MIPM 679 MCDB 679) (1-0) Cr 1 F *Prereq Permission of instructor* Horner Current theories encompassing light optics photomicrography photographic printing biological specimen preparation microtomy general staining histochemistry autoradiography and cytophotometry

679L Light Microscopy Laboratory (MIPM 679L MCDB 679L) (0 9) Cr 3 F *Prereq Permission of instructor enrollment in 679* Horner Laboratory exercises related to all topics covered in 679 Materials fee

680 Scanning Electron Microscopy (MIPM 680 MCDB 680) (1 0) Cr 1 F *Prereq Permission of instructor* Horner Current theories encompassing scanning electron microscopy photography and specimen preparation

680L Scanning Electron Microscopy Laboratory (MIPM 680L MCDB 680L) (0-6) Cr 2 F *Prereq Permission of instructor enrollment in 680* Horner Laboratory exercises related to all topics covered in 680 Materials fee

681 Transmission Electron Microscopy (MIPM 681 MCDB 681) (2-0) Cr 2 S *Prereq Permission of instructor* Horner Current theories encompassing electron optics biological specimen preparation ultramicrotomy general staining cytochemistry immunocytochemistry autoradiography negative staining shadowing electron diffraction and image analysis

681L Transmission Electron Microscopy Laboratory (MIPM 681L MCDB 681L) (0 9) Cr 3 S *Prereq 679 679L permission of instructor enrollment in 681* Horner Laboratory exercises related to all topics in 681 Materials fee

682 X ray Microanalysis (MIPM 682 MCDB 682) (1-0) Cr 1 S *Prereq 681 permission of instructor* Horner Current theories encompassing elemental analysis of bulk and thin sectioned biological specimens using scanning electron microscopy

682L X ray Microanalysis Laboratory (MIPM 682L MCDB 682L) (0 3) Cr 1 S *Prereq 681 681L permission of instructor enrollment in 682* Horner Laboratory exercises related to all topics covered in 682 Materials fee

684 Plant Ecology Colloquium (2-0) Cr 2 each time taken F S *Prereq Permission of instructor* Discussion of ecological literature and research term paper and oral presentation different topic chosen by instructor each semester

696 Seminar in Plant Physiology and Molecular Biology (Agron 696 B B 696 For 696 Gen 696 Hort 696) Cr 1 each time taken F S Presentations and discussions of recent literature and problems under investigation

698 Seminar Cr 1 each time taken Meetings of botany staff and students to discuss recent literature and problems under investigation
- B Non vascular Plants
- C Systematics and Evolution
- D For all staff and students in botany
- E Molecular Cellular and Developmental Biology (MCDB)
- F Ecology
- G Aquatic and Wetland Ecology

699 Research Cr var
- A Plant Physiology and Molecular Biology
- B Morphology
- D Mycology
- E Systematics and Evolution
- F Plant Ecology
- J Cytology
- K Aquatic and Wetland Ecology

Courses Offered at the Iowa Lakeside Laboratory

Written permission of the instructor is prerequisite to all courses offered at the Iowa Lakeside Laboratory For current information concerning courses registration and housing see the annual *Iowa Lakeside Laboratory Bulletin* This bulletin is usually available from participating departments after February 15 Numbers beginning with L indicate numbers used in the *Iowa Lakeside Laboratory Bulletin*

301L (L 101) Field Natural History Cr 5 SS Biological diversity and its causes lectures and field trips to native lake marsh forest and prairie habitats Measuring the environment sampling and identifying the organisms experimenting with the ecosystem understanding species interactions and appreciating influences of past and present climates and geological events on natural ecosystems of the region

302L (L 102) Field Botany Cr 5 SS Introduction to fieldwork in natural history of local plants emphasizing the ecology of distribution dispersal breeding systems plant herbivore interactions and pollination Field and laboratory work as well as relevant reading and discussion Intended for students with at least one course in biology and an interest in the field experience

367L (L 105) Plant Taxonomy Cr 5 SS *Prereq 10 credits in biological science* Basic principles of classification and evolution of vascular plants Taxonomic tools techniques and the native flora Group projects

422L (L 122) Prairie Ecology Cr 5 SS Study of the basic patterns and underlying physical and biotic causes of both regional and local distributions of plants and animals of North American prairies Field and laboratory analyses projects Intended for students familiar with basic principles in biology and ecology

490L Independent Study

559L (L 119) Biology of Bryophytes and Pteridophytes Cr 5 Alt SS offered 1995 *Prereq 10 credits in biological science* Farrar Collection and identification of mosses liverworts clubmosses spikemosses quillworts horsetails and ferns Analysis of microclimates soils and community structure with the goal of explaining and predicting species occurrence

575L (L 115) Field Mycology Cr 5 Alt SS offered 1994 *Prereq 5 credits in botany* Tiffany Collection and taxonomy of fungi and relation of their occurrence to environmental factors Preparation and use of mycological exsiccati Field trips

580L (L 117) Ecology and Systematics of Diatoms Cr 5 SS *Prereq 10 credits in biological science* Field experience in the study of freshwater diatoms Environmental factors affecting growth and distribution are stressed Techniques collection and preparation of diatom samples

590L Special Topics

699 Research

Courses Offered at the Gulf Coast Research Laboratory (GCRL), Ocean Springs, Mississippi

Written permission of the coordinator for the Gulf Coast Research Laboratory 201 Bessey Hall Iowa State University Ames Iowa 50011 is prerequisite to all courses offered at the Gulf Coast Laboratory Numbers in parentheses beginning with MAR are GCRL numbers

341G (MAR 420G) Marine Phycology Cr 2 SS *Prereq 10 credits in biology including botany* A survey based upon local examples of the principal groups of marine algae treating structure reproduction distribution identification and ecology

341LG (MAR 420L) Marine Phycology Lab Cr 1 SS Lab to accompany 341G

342G (MAR 421) Coastal Vegetation Cr 2 SS *Prereq 10 credits in biology including botany* A study of general and specific aspects of coastal vegetation with emphasis on local examples

342LG (MAR 421L) Coastal Vegetation Lab Cr 1 SS Lab to accompany 342G

343G (MAR 422) Salt Marsh Plant Ecology Cr 1 SS The botanical aspects of local marshes includes plant identification composition and structure

343LG (MAR 422L) Salt Marsh Plant Ecology Lab Cr 2 SS Lab to accompany 343G

490G (MAR 490) Independent Study

590G (MAR 491) Special Topics

Business Administration

David L Shrock Dean

Undergraduate Study

For undergraduate curriculum leading to the degree bachelor of science majors in accounting finance management management information systems marketing or transportation and logistics see *College of Business Curricula*

The area of business administration supports the undergraduate programs in the departments of Accounting Finance Management Marketing and Transportation and Logistics by providing specialized coursework in orientation to business an introduction to careers in business and cooperative education opportunities The associate dean for undergraduate studies administers the business administration area

Graduate Study

Thomas I Chacko Professor in Charge Graduate Programs in Business Administration

Max S Wortman Jr Professor in Charge Agribusiness Program

Two programs are offered at the graduate level a master of business administration (M B A) program and a master of science (M S) in business administrative sciences program

Master of Business Administration (M B A)

The College of Business offers a 48 credit program leading to a nonthesis master of business administration degree with a specialization in agribusiness or an emphasis in one of the functional areas of business This program prepares students for careers in business The coursework is designed to provide the knowledge skills and abilities for managerial success and leadership in organizations The M B A is the professional management education program for those pursuing careers in business or industry

Students working toward the master of business administration are required to complete a series of core courses in the basic disciplinary and functional areas of business (accounting economics quantitative analysis and statistics finance marketing operations

management organizational behavior management information systems international business ethics and social responsibility strategic management and business policy) and advanced elective coursework Students may tailor their elective courses to design specialized study in agribusiness or any of the functional areas of business

Courses for the M B A are provided by the departments of Accounting Economics Finance Management Marketing Statistics and Transportation and Logistics Courses from other departments may also be chosen to meet specific student interests Students *interested in the agribusiness program* may need to fulfill production agriculture requirements by taking courses in the College of Agriculture

Students may enroll in either the full-time resident program or the part-time Saturday program The latter is intended for those individuals who *desire an* M B A *without* interrupting their employment and professional careers

The M B A program is open to *all* individuals with a baccalaureate degree It is not essential that applicants have previous business-related education In fact undergraduates from liberal arts science and technical programs are especially encouraged to apply However some accounting economics and statistics knowledge and computer skills would be beneficial Academic potential and promise for a productive career in business and for managerial success and leadership in organizations are important criteria for admission Thus applicants must submit Graduate Management Admission Test (GMAT) scores official transcripts of previous academic work a personal essay information on work experiences and three letters of reference International students whose native language is not English and who did not graduate from a U S college or university are required to submit the Test of English as a Foreign Language (TOEFL) scores Admission is granted into the resident M B A program for fall semester only and into the Saturday M B A program for summer session entry only The application deadline *for the M B A program* is May 1 (March 1 for international students)

Master of Science (M S) in Business Administrative Sciences

The College of Business offers graduate work leading to the master of science degree with a major in business administrative sciences All the departments in the college namely Accounting Finance Management Marketing and Transportation and Logistics and the departments of Economics and Statistics cooperate in providing coursework toward this degree The program is designed to serve those students who desire specialized study of an area within business at the master s level It also serves to develop their research capabilities
The M S degree is better suited for students with degrees or backgrounds in business as they may complete the program within the 30 credit minimum Students without business backgrounds are required to fulfill prerequisites and common body of knowledge coursework in accounting finance management information systems marketing organizational behavior operations management global business and business ethics The program per se is composed of 6 credits of required courses in economics and statistics plus 3 to 6 credits of thesis and 18 to 21 credits of coursework in an area of specialization The student with the help of a program of study committee designs an educational program in specialized functional or industry areas within business

Application deadline for the M S program is May 1 for fall admission and October 1 for spring admission Applicants must submit official transcripts of previous educational coursework and degrees the Graduate Management Admission Test (GMAT) scores a second essay and three letters of reference International students whose native language is not English and who did not graduate from a U S college or university are required to submit the Test of English as a Foreign Language (TOEFL) scores

Master of Business Administration/Master of Architecture (M B A./M Arch)

The College of Business and the Department of Architecture jointly offer graduate study for the double degrees M B A /M Arch This double-degree program is designed for archtiecture undergraduates who want to pursue managerial careers in architectural firms Students must make application into both programs Interested students should contact the College of Business Graduate Programs Office or the Department of Architecture for more information

Courses Primarily for Undergraduate Students

100 Orientation (1 0) Cr R F S SS First 8 weeks *Group advising for pre-business* and business majors Review of college and university requirements transfer credits academic planning university policies and deadlines and registration procedures Offered on a satisfactory fail basis only

200 Introduction to Careers in Business (1-0) Cr 0 5 F S 8 weeks *Prereq Sophomore classification* Introduction to career fields open to business majors Presentations by business professionals in various areas of business Offered on a satisfactory fail basis only

300 Cooperative Education Cr R Required of all cooperative students *Prereq Permission of department* Students must register for this course prior to commencing each work period

310 Business Management of Veterinary Practice (2 0) Cr 2 *Prereq Junior classification in veterinary medicine* Organization of veterinary practice financial and capital decisions investment planning and marketing considerations

490H *Independent Study* *Cr 1 to 3 each time* taken *Prereq Admission to the Business Honors Program senior classification permission of instructor*

Courses for Graduate Students

511 Strategic Planning and Analysis Cr 1 F *Prereq Admission to M B A program* An *introduction to the strategic planning* process How to formulate strategy in context of environmental opportunities and threats how to analyze industry competition and how to implement strategies and build competitive advantages

512 Survey of Financial and Managerial Accounting Cr 1 F *Prereq Admission to M B A program* Focuses on both financial and managerial accounting topics Financial reporting and analysis basic cost concepts and behaviors for analysis

521 Human Behavior in Organizations Cr 1 F *Prereq 511* Human behavior in organizations and the nature of organizations from a managerial perspective Current theories and practices of management individual differences motivation and reward strategies

522 Product Costing and Accounting Data for Planning and Control Cr 1 F *Prereq 512* Cost volume-profit analysis just in-time accounting concepts absorption and variable costing standard costing and budgeting Decision making and rele vant accounting information for planning and control

531 Managing Organizational Behavior Cr 1 F *Prereq 521* Human behavior in organizations and the nature of organizations from a managerial perspective Current theories and practices regarding job satisfaction job performance job design leadership groups and organizational effectiveness including organizational structure environment and technology

532 Survey of Information Systems Concepts Cr 1 F *Prereq 511* Current theories and practices of information processing and decision making Focus on information technology and its uses in improving work practices products and tools for decision support Use of artificial intelligence and other developments in technology

541 Financial Markets and Valuation Cr 1 S *Prereq 511* Maximization of shareholder wealth as the goal of the firm and its managers mathematics of valuation and discounted cash flow economics of financial markets market valuation of corporate securities

542 Managing Information Systems Technology Cr 1 S *Prereq 532* Competitive pressures and risks of information technology (IT) Developments in IT and establishment of special purpose systems Setting IT strategy information system planning and *development of enterprise architecture Focus on* systems development and implementation Audit and control of information systems

543 Marketing Opportunities Analysis Cr 1 S *Prereq 511 The scope of marketing and the* identification and assessment of marketing opportunities Consumer behavior and decision making process organizational buyer behavior and the role of research in the marketing planning process Market definition and analysis segmentation competitor analysis targeting and strategic decisions involved in developing the marketing program

544 International Business Environment Cr 1 S *Prereq 511* Survey of the structure and environment of international business Patterns of international trade economic and monetary systems cross-cultural and legal aspects of international business

551 Corporate Financial Decisions Cr 1 S *Prereq 541* Managing for shareholder value the financial marketplace as the test of value estimation of opportunity costs of capital capital investment decisions capital structure policy working capital management

552 Operations Management for Planning and Control Cr 1 S *Prereq 511 Stat 328* The basic planning and control procedures for service and manufacturing systems Forecasting Pareto analysis aggregate planning resource requirements planning scheduling quality management

553 Marketing Mix Decisions and Strategies Cr 1 S *Prereq 543* Developing marketing mix strategies and relating them to the overall strategic marketing plan Organizational design for marketing strategy implementation and control and effectiveness

554 Managerial Issues in Global Business Cr 1 S *Prereq 511* Global dimensions of the functional disciplines of business Tools for developing global strategies such as economic analysis and risk analysis

561 Legal Social and Political Environments of Business Cr 1 S *Prereq 511* The legal regula tory economic social and political contexts of business

562 Operations Strategy Cr 1 S *Prereq 552* Strategic operations management topics including world class manufacturing process Manufacturing and service case studies

563 Ethics and Social Responsibility Cr 1 S *Prereq 511* The ethical issues moral dilemmas and stakeholder responsibilities embraced by today s corporate decision makers The morality of current management models and practices Corporate governance and control moral reasoning in groups whistleblowing employee safety truth in advertising environmental pollution plant closings insider trading employee rights

564 Business Policy and Strategy Cr 1 S *Prereq 522 531 542 551 552 553* Critical analysis of case studies in strategic management with an emphasis on integrative decision making Issues in business functional areas in light of programs policies and implementation of strategy

576 Contemporary Topics in Agribusiness Management I (Mgmt 576) See *Management*

577 Contemporary Topics in Agribusiness Management II (Mgmt 577) See *Management*

599 Creative Component Cr 3 Prereq *Graduate classification permission of supervisory committee chair* Preparation and writing of creative component

A Accounting
B Economics
C Finance
E Management
F Marketing
G Statistics
H Transportation and Logistics
I Agribusiness
J General Business

699 Research Cr 3 to 6 arranged F S SS *Prereq Graduate classification permission of major professor* Research

Chemical Engineering

Terry S King Chair of Department

Professors Abraham Burnet Doraiswamy Glatz Hill Jolls King Larson, Reilly Schrader Seagrave Ulrichson Wheelock Youngquist

Emeritus Professors Boylan

Associate Professors Hebert

Emeritus Associate Professors Collins

Assistant Professor Rollins

Undergraduate Study

For undergraduate curriculum in chemical engineering leading to the degree bachelor of science see *College of Engineering Curricula*

Chemical engineering is a profession which provides a link between scientific knowledge and man-made products The chemical engineer relies on science experience creativity and ingenuity to produce these materials economically Almost everything of a material nature used by society today has at some point felt the influence of the chemical engineer From raw materials such as minerals coal petroleum and agricultural products chemical engineers create new forms of fuels new materials for construction pharmaceuticals foodstuffs synthetic textiles plastics solid state electronic components and dozens of other materials The chemical engineer s influence has been felt in the development of nuclear energy fuel cells automatic controls biochemical processes artificial kidneys and other medical-related devices as well as in the development of air and water pollution control systems Many new and equally exciting challenges await the practicing chemical engineer of the future

The profession of chemical engineering embraces a wide variety of activities including research process development product development, design, manufacturing supervision technical sales consulting and teaching The engineer can be behind a desk in a laboratory in a manufacturing plant or engaged in nationwide and worldwide travel

Successful chemical engineers find chemistry mathematics, and physics to be interesting and exciting The curriculum in chemical engineering includes continued study of chemistry mathematics and physics as well as intensive study in the engineering sciences such as thermodynamics heat transfer mass transfer fluid mechanics system analysis and process synthesis and design

A cooperative education program is available to students in chemical engineering See *Cooperative Programs College of Engineering*

Graduate Study

The department offers work for the degrees master of science master of engineering and doctor of philosophy with major in chemical engineering and minor work to students taking major work in other departments

Prerequisite to major graduate work is a bachelor s degree in chemical engineering chemistry or other related field Students with undergraduate background other than chemical engineering should contact the department for further details

The master of engineering degree requires a creative component A thesis is required for the master of science degree

Interdepartmental programs between chemical engineering and biomedical engineering are provided under the sponsorship of the colleges of Engineering and Veterinary Medicine Laboratory facilities are available in both biomedical engineering and chemical engineering See *Biomedical Engineering*

The department also participates in the interdepartmental major in water resources and in the interdepartmental minor programs in mineral resources and technology and social change (See *Index*)

Open to graduate students for minor credit only All 300 and 400 level courses except 302 391 392 397 401, and 490

Courses Primarily for Undergraduate Students

210 Material and Energy Balances (3-0) Cr 3 F S *Prereq Chem 178 Math 166* Introduction to chemical processes Physical behavior of gases liquids and solids Application of material and energy balances to chemical engineering equipment and processes

230 Design Analysis Laboratory (2 2) Cr 3 F S *Prereq 210 Engr 160* Introduction to process simulation Mathematical representation of chemical and physical properties Material and energy balances with recycle Numerical methods

298 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

302 Seminar (1-0) Cr R S *Prereq Junior classification in chemical engineering* Offered on a satisfactory-fail basis only

324 Chemical Engineering Laboratory I (0-3) Cr 1 F S *Prereq Credit or enrollment in 356* Experiments covering basic chemical engineering measurements material and energy balances and momentum transport operations Computer applications

325 Chemical Engineering Laboratory II (0-3) Cr 1 S *Prereq 324 credit or enrollment in 357 and 382* Experiments in heat and mass transfer thermodynamics and chemical reactor performance

356 Momentum Transport Operations (3-0) Cr 3 F S *Prereq 210 Phys 221 credit or enrollment in 230 Math 267* Momentum and mechanical energy balances Incompressible and compressible fluid flow Applications to fluid drag piping system design filtration packed beds and settling

357 Heat and Mass Transfer (3-0) Cr 3 F S *Prereq 356* Conduction and diffusion convective heat and mass transfer boiling and condensation radiation design of heat exchange equipment

358 Mass Transfer Operations (4 0) Cr 4 F S *Prereq 357* Analysis and design of continuous contacting and multistage separation processes Binary and multicomponent distillation absorption extraction evaporation simultaneous heat and mass transfer

381 Chemical Engineering Thermodynamics (4-0) Cr 4 F S *Prereq 230 Math 267 Phys 222* Application of thermodynamic principles to chemical engineering problems Energy balances and entropy accounts Thermodynamic properties of fluids phase equilibria chemical reaction equilibria

382 Chemical Reactor Design (3 0) Cr 3 F S *Prereq 381 credit or enrollment in 357* Kinetics of chemical reactions design of homogeneous and heterogeneous chemical reactors

391 Foreign Study (1-0) Cr 1 S *Prereq 356 permission of instructor* Preparation for foreign study program Offered on a satisfactory fail basis only Credit for graduation allowable only upon completion of 392

392 Foreign Study Program Cr 2-6 SS *Prereq 391* Study of chemical engineering including laboratories and lectures at University College London Comparative study of U S and U K manufacturing facilities Expenses required Offered on a satisfactory fail basis only Field trip fee

397 Engineering Internship Cr R F S *Prereq Permission of department* One semester maximum per academic year professional work period

401 Seminar (1-0) Cr R F *Prereq Senior classification in chemical engineering* Offered on a satisfactory fail basis only

410 Industrial and Engineering Chemistry (2-3) Cr 3 F *Prereq 382 and Chem 331 or graduate standing in chemistry* Integration of chemistry and chemical engineering principles as practiced in modern industry Processing routes and procedures in the chemical petroleum biochemical and semiconductor industries

415 Biochemical Engineering (3-0) Cr 3 S *Prereq 357 382 recommended Chem 331* Application of basic chemical engineering principles in biochemical and biological process industries such as fermentation food processing enzyme technology and biological waste treatment

421 Process Control (2 2) Cr 3 F S *Prereq Credit or enrollment in 358 Math 267* Control of industrial chemical processes Device applications and limitations Dynamics of chemical process components and process control systems

426 Chemical Engineering Laboratory III (0-6) Cr 2 F S *Prereq 325 358* Investigation of chemical engineering process equipment

430 Process and Plant Design (2-6) Cr 4 F S *Prereq 358 382* Synthesis of chemical engineering processes equipment and plants Cost estimation and feasibility analysis

441 Modeling and Simulation (3-0) Cr 3 S *Prereq 358 382* Simulation of behavior of chemical processes trial and error calculations numerical integration and other numerical methods Problems involving fluid flow distillation heat transfer process control and reactor design

443 Polymers and Polymer Engineering (3-0) Cr 3 F *Prereq 357 382 recommended Chem 331* Chemistry of polymers addition and condensation polymerization Physical and mechanical properties polymer rheology production methods Fabrication and extrusion equipment operation Applications of polymers in the chemical industry

456 Transport Phenomena (3 0) Cr 3 S *Prereq 358* Applied mathematical analysis of transport phenomena in chemical processes and equipment Mathematical models for momentum heat and mass transfer in fluid continua

462 Advanced Unit Operations (3 0) Cr 3 F *Prereq 358* Analysis of chemical processes and specification of equipment from the unit operations viewpoint Momentum heat and mass transfer in multi phase systems

470 Petroleum Production and Refining (3-0) Cr 3 S *Prereq Chem 178* Introduction to production and refining of petroleum and natural gas origins and characterization methods of exploration production transportation and refining Suitable for most advanced undergraduates and graduate students in the physical sciences and engineering

490 Independent Study (0 3 to 18) Cr 1 to 6 Introduction to research methods investigation of an approved topic
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

508 Mineral Processing Operations (MN RS 508 M S E 508) See *Mineral Resources*

515 Coal Science and Technology (3 0) Cr 3 Alt F offered 1993 *Prereq Chem 321 331* Physical and chemical properties of coal methods of analysis and characterization Industrial processes for cleaning carbonizing desulfurizing gasifying and liquefying coal to produce cleaner more useful fuels

530 Process Design and Optimization (2-3) Cr 3 F *Prereq 430* Advanced process synthesis Optimum seeking methods applicable to process design and evaluation

539 Fluidized Bed Processes (M E 539) See *Mechanical Engineering*

540 Biothermodynamics and Transport Phenomena (B M E 540) (3 0) Cr 3 S *Prereq 210 Math 266 Phys 222* The principles of thermodynamics and transport phenomena applied to the study of physiology and the design and operation of artificial organs and life support systems

545 Analytical and Numerical Methods (3-0) Cr 3 F *Prereq 358 Math 267* Analysis of equipment and processes by analytic and/or numerical solution of descriptive differential equations Operational and series techniques boundary value problems numerical interpolation and approximation integration techniques

552 Transport Phenomena I (4-0) Cr 3 F *Prereq 357 381 Math 267 credit or enrollment in 545* Equations of change for mass energy and momentum according to phenomenological and molecular models Introduction to transport in multicomponent systems Exact and approximate solutions to the equations of motion One-hour weekly demonstrations

553 Transport Phenomena II (3 0) Cr 3 S *Prereq 552* Convective and radiative heat transfer boiling condensation multicomponent diffusion mass transfer models High transfer rate effects Simultaneous heat mass and momentum transfer

565 Processing of Solid State Materials (3 0) Cr 3 S *Prereq 382* Application of chemical engineering principles in the semiconductor and related industries Analysis of chemical and physical processes in materials fabrication

583 Advanced Thermodynamics (4-0) Cr 4 S *Prereq 381* Application of thermodynamic principles to chemical engineering problems Thermodynamic properties of non ideal fluids and solutions phase and chemical-reaction equilibria/stability

587 Advanced Chemical Reactor Design (3-0) Cr 3 F *Prereq 382* Kinetics of heterogeneous reactions Analysis and design of non ideal flow and heterogeneous reactors

588 Catalysis and Catalytic Processes (3-0) Cr 3 S *Prereq 382 Principles and applications of* heterogeneous and homogeneous catalysis Adsorption Reaction kinetics and mass transfer effects Catalyst characterization Industrial catalytic processes

590 Special Topics Cr 2 to 6 each time taken Investigation of an approved topic on an individual basis

595 Special Topics Cr 2 or 3 each time taken *Prereq Permission of instructor* When offered with a letter suffix the following letters are reserved for the topics listed
A Separations
B Advanced Control Theory
C Crystallization
D Thermodynamics
E Kinetics and Catalysis
F Transport Operations
G Bioengineering
H Bioseparations

599 Creative Component Cr var

Courses for Graduate Students, major or minor

601 Seminar (1-0) Cr R F S Offered on a satisfactory fail basis only

645 Advanced Calculation Methods for Chemical Engineers (3 0) Cr 3 Alt S offered 1994 *Prereq 545* Advanced analysis and design of equipment and processes requiring specialized mathematical techniques

652 Advanced Momentum Transport (2 0) Cr 2 Alt S offered 1994 *Prereq 552* Advanced topics in momentum transport and fluid mechanics including study of recent literature

653 Advanced Mass Transport (2-0) Cr 2 Alt F offered 1993 *Prereq 553* Advanced topics in mass transport including study of recent literature

654 Advanced Heat Transport (2-0) Cr 2 Alt F offered 1994 *Prereq 553* Advanced topics in heat transfer including study of recent literature

683 Non Equilibrium Thermodynamics (3-0) Cr 3 Alt SS offered 1995 *Prereq 552 583* Thermodynamics of irreversible processes including diffusion and sedimentation electrochemical processes muscle contraction thermal diffusion and membrane transport

690 Advanced Topics Cr var

699 Research

Chemistry

James H Espenson Chair of Department

Professors Angelici Barton Corbett Cotton Depristo Espenson Franzen Fritz Gordon Hoffman Houk Jacobson Johnson Kraus Larock McCarley Ng G Russell Small Struve Thiel W Trahanovsky Verkade Yeung

Emeritus Professors Fassel Gerstein Hansen Hutton King Martin Powell, Ruedenberg, Svec, Voigt, Wilhelm

Associate Professors Edgar Greenbowe Kostic Porter Woo

Assistant Professors Jenks Miller Petrich M Russell Schwabacher K Trahanovsky

Undergraduate Study

For undergraduate curriculum in liberal arts and sciences leading to the degrees bachelor of science and bachelor of arts see *Liberal Arts and Sciences, Curriculum*

Graduates holding the B S degree in chemistry qualify in many fields as teachers of chemistry as supervisors in industry as technical sales personnel and as research chemists in federal state municipal academic or industrial laboratories

The B A degree is useful for students who intend to pursue studies in parallel areas such as secondary school teaching or to obtain joint majors or strong minors The B A degree does not prepare students as well for graduate study or professional employment in chemistry

Undergraduate chemistry students take not only studies in chemistry but also courses in mathematics physics German Russian or French and in cultural subjects Students with the necessary high scholastic standing usually continue with graduate work where they can explore more thoroughly the specialized areas of chemistry in which they are interested

Liberal arts majors who wish to transfer into chemistry at the end of their second year may still complete all degree requirements and graduate within five years ,

Undergraduate students seeking the B S degree in chemistry usually take courses essential to the degree program according to the following schedule

First year Chem 177M 177N 178M 210 Math 165 166 Engl 104 105 Lib 160
Second year Chem 331 332 333B 334B Math 265 Phys 221 222
Third year Chem 321 322 322L 316 301 Engl 314 Foreign language requirement
Fourth year Chem 402 401L 399 or 499 (recommended) advanced chemistry electives (2 to 5 credits)

Undergraduate students seeking the B A degree in chemistry usually have the following courses in their degree programs as minimum requirements 177 (or 167) 177L (or 167L) 178 211 301 316 321 321L or 322L 322 331 332 333A 334A Math 165 166 and Phys 221 222 are required as supporting work

The department offers a minor in chemistry which may be earned by credit in Chem 177 177L (or 167 and 167L) 178 211 321 331 333A and one of the following Chem 301 316 or 322 and 321L or 332 and 334A The total minimum credits in chemistry thus will be 20 to 23 depending on which advanced courses are selected

English proficiency requirement The department requires an average grade of C or better in English 104 105 and 314 or a grade of C– or better in each of English 104 105 and 314

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in analytical inorganic organic and physical chemistry as well as the degrees master of science and doctor of philosophy in chemistry Co-majors may be taken between areas within chemistry or between one of the areas in chemistry and another department Courses in other areas of chemistry as well as courses in other departments may be used to satisfy the requirement for coursework outside the major field Minor work is offered to students taking major work in other departments The department participates in the interdepartmental major in toxicology

The Department of Chemistry requires all graduate students majoring in chemistry to teach as part of their training for an advanced degree

Prerequisite to major graduate work is the completion of undergraduate work in chemistry mathematics and physics substantially equivalent to that required of undergraduate students at this institution

Open to graduate students for minor credit only 301 316 321, 321L 322 331 332 401L 402

The course numbers for general chemistry courses include 50 and 160-178

Index to field of work is given by the second and third digits of course numbers
(a) Inorganic Chemistry 00-09
(b) Analytical Chemistry 10-19
(c) Physical Chemistry 20-29 and 60-69
(d) Organic Chemistry 30-40
(e) Interdisciplinary Chemistry 60-89
(f) Research 99

Courses Primarily for Undergraduate Students

50 Preparation for General Chemistry (2-0) Cr 0 F S *Prereq 1 year high school algebra* Basic methods and concepts of chemistry students must master before they are ready for college chemistry For students intending to enroll in general chemistry and who have not taken high school chemistry or have otherwise deficient backgrounds

***160 Chemistry in Modern Society** (3-0) Cr 3 S Aspects of chemistry visible to a nonscientist in our society A nonmathematical survey of selected areas of chemistry with emphasis on the interface be tween chemistry and other fields of human activity

***163, 164 General Chemistry** 163 (4-0) Cr 4 F S SS 164 (3 0) Cr 3 F S *Prereq 163 1 year of high school algebra and either Chem 50 or 1 year of high school chemistry and credit or enrollment in 163L 164 163 and 163L* Principles of chemistry and properties of matter explained in terms of modern chemical theory 163 stoichiometry atomic structure chemical bonding states of matter energy relations solution behavior acid base and oxidation reduction reactions nuclear chemistry 164 Kinetics thermodynamics and equilibrium electrochemistry descriptive chemistry of metallic and nonmetallic elements coordination compounds and organic molecules

***163L 164L Laboratory in General Chemistry** (0-3) Cr 1 each 163L F S SS 164L F S *Prereq 163L Credit or enrollment in 163 164L credit or enrollment in 164* Laboratory to accompany 163 and 164 163L must be taken with 163 164L is not a necessary corequisite with 164 Materials fee

****167 General Chemistry for Engineering Students** (4-0) Cr 4 F S *Prereq 50 or high school chemistry* Principles of chemistry and properties of matter explained in terms of modern chemical theory with emphasis on topics of general interest to the engineer This is a terminal course intended for students who do not plan to take additional courses in chemistry

***167L Laboratory in General Chemistry for Engineering** (0 3) Cr 1 F S *Prereq Credit or enrollment in 167* Laboratory to accompany 167 Materials fee

****177 178 General Chemistry** 177 (4 0) Cr 4 F S 178 (3-0) Cr 3 F S *Prereq 177 50 or 1 year high school chemistry and credit or enrollment in 177L 178 177 177L or 167 167L* Chemistry explored at a greater depth and with more emphasis on concepts problems and calculations than 163 164 Recommended for physical and biological science majors chemical engineering majors and all others intending to take 300-level chemistry courses 177M 178M For chemistry and biochemistry majors and qualified students seeking a strong emphasis in chemistry 177 Principles and quantitative relationships (stoichiometry chemical equilibrium acid base chemistry thermodynamics changes of state solution behavior atomic structure chemical bonding) 178 Electrochemistry complex ion equilibria rates and mechanisms of reactions nuclear chemistry and descriptive topics (nonmetals transition metals coordination compounds organic compounds polymers biological molecules)

***177L 178L Laboratory in General Chemistry** (0 3) Cr 1 each 177L F S 178L F S *Prereq 177L Credit or enrollment in 177 178L Credit or enrollment in 178* Laboratory to accompany 177 and 178 177L must be taken with 177 178L is not a necessary corequisite with 178 177N For chemistry and biochemistry majors Materials fee

210 Quantitative Analysis (2-6) Cr 4 S *Prereq 177 177L or 167 167L credit or enrollment in 178* Theory and practice of elementary gravimetric volumetric chromatographic and spectrophotometric analysis For chemistry and biochemistry majors and qualified students seeking a strong emphasis in chemistry Materials fee

***211 Quantitative Analysis** (2 6) Cr 4 F S SS *Prereq 164 164L or credit or enrollment in 178* Theory and practice of elementary gravimetric volumetric chromatographic and spectrophotometric analysis Chemistry and biochemistry majors and students seeking a strong emphasis in chemistry should elect Chem 210 Materials fee

***231 Elementary Organic Chemistry** (3 0) Cr 3 F S SS *Prereq 163 163L credit or enrollment in 232* A survey of modern organic chemistry including nomenclature structure and bonding and reactions of hydrocarbons and important classes of natural and synthetic organic compounds For students desiring only an elementary course in organic chemistry Students in physical or biological sciences and premedical or preveterinary curricula are encouraged to take the full year sequence 331 and 332 (with the accompanying laboratories 333A and 334A)

232 Laboratory in Elementary Organic Chemistry (0-3) Cr 1 F S SS *Prereq Credit or enrollment in 231* Laboratory to accompany 231 Materials fee

299 Undergraduate Research (for Freshmen and Sophomores) Cr var *Prereq Permission of staff member with whom student proposes to work*

301 Inorganic Chemistry (2 0) Cr 2 S *Prereq 321* Chemistry of the nonmetallic elements descriptive and systematic chemistry of the nonmetallic elements correlation of structure and bonding with chemical or physical properties thermodynamic and kinetic aspects

316 Instrumental Methods of Chemical Analysis (2 6) Cr 4 F *Prereq 210 or 211* Quantitative and qualitative instrumental analysis Operational theory of instruments atomic and molecular absorption and emission spectroscopy electroanalysis liquid and gas chromatography literature of chemical analysis Materials fee

321 Physical Chemistry I (3-0) Cr 3 F S *Prereq 178 Math 166 or Math 176 Phys 222 recommend ed* Classical thermodynamics 1st 2nd and 3rd laws with applications to gases and interfacial systems multicomponent multiphase equilibrium of reacting systems surface chemistry and electrochemical cells

***321L Laboratory in Physical Chemistry for Engineers** (1 3) Cr 2 F S *Prereq Credit or enrollment in 321* Error analysis use of computer thermodynamics of gases transport properties thermochemistry thermodynamics of phase equilibrium chemical kinetics polymers mass spectrometry Materials fee

322 Physical Chemistry II (3-0) Cr 3 F S *Prereq Chem 321* Kinetic theory of gases transport properties chemical kinetics quantum mechanics atomic and molecular structure spectroscopy statistical thermodynamics solids

322L Laboratory in Physical Chemistry (1-6) Cr 3 S *Prereq Credit or enrollment in 322* Error analysis use of computer thermodynamics of gases transport properties thermochemistry thermodynamics of phase equilibrium chemical kinetics polymers molecular spectroscopy x ray crystallography nuclear chemistry surface chemistry mass spectrometry Materials fee

331, 332 Organic Chemistry (3 0) Cr 3 each 331 F S 332 F S 332C S *Prereq 331 178 enrollment in 333A highly recommended 332 331 enrollment in 334A highly recommended* Modern organic chemistry including nomenclature synthesis structure and bonding reaction mechanisms natural products carbohydrates and proteins For students majoring in physical and biological sciences premedical and preveterinary curricula chemistry and biochemistry Chemistry and biochemistry majors should take 332C Students desiring only one semester of organic chemistry are encouraged to take 231 (with the accompanying laboratory 232) not 331

333 334 Laboratory in Organic Chemistry A (0-3) Cr 1 each B (0 6) Cr 2 each 333 F S 334 F S *Prereq 333 credit or enrollment in 331 334 333 credit or enrollment in 332* Chemistry and biochemistry majors should take 333B and 334B Materials fee

399 Undergraduate Research Cr var *Prereq Permission of staff member with whom student proposes to work and junior or senior classification*

401L Inorganic Chemistry Laboratory (0-4) Cr 2 F *Prereq 301* Preparation and characterization of inorganic and organometallic compounds by modern techniques For students majoring in chemistry or biochemistry Materials fee

402 Inorganic Chemistry (3-0) Cr 3 F *Prereq 301* Chemistry of the metallic elements including members of main groups and transition series Structure bonding thermodynamic and kinetic aspects of the chemistry of elements having d and f valence electrons Crystal field and molecular orbital theory applied to complex ions and organometallic compounds

***470 (570 DL) Structure and Bonding** (2-0) Cr 2 F *Prereq 301 322* Systematic development of orbital concepts for electronic structures in general molecular systems Explanation and prediction of chemical bonding patterns and molecular properties on the basis of such electronic structures Applications to various classes of inorganic and organic molecules

490 Independent Study Cr var *Prereq Completion of 6 credits in chemistry at the intermediate or higher level and permission of instructor No more than 9 credits of Chem 490 may be counted toward graduation*

499 Senior Research (0-6 or 0-9) Cr 2 or 3 each time taken *Prereq Permission of staff member with whom student proposes to work B average in all chemistry physics and mathematics courses* Research in chosen area of chemistry with final written report as senior thesis This course should be elected for two consecutive semesters just preceding graduation For students majoring in chemistry

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[a]Credit may not be applied toward graduation for more than one of the following pairs or groups of courses 160 and any other chemistry course 163 167 and 177 164 and 178 (and accompanying labs) 210 and 211 231 and 331 332 321L and 322L 231 and B B 221

[b]Credit by examination (test-out exams) for 163 164 167 177 and 178 is available only to students who are not currently enrolled in the course

[c]See page 119 for information on dual listed courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Advanced Inorganic Chemistry (2-0) Cr 2 F *Prereq 301* Concepts of structure bonding and chemical reactivity applied to inorganic compounds of the metallic and nonmetallic elements For students not majoring in inorganic chemistry

501 Inorganic Preparations (0-4) Cr 2 F *Prereq 402* Preparation and characterization of inorganic and organometallic compounds by modern research techniques Materials fee

503 Bioinorganic Chemistry (B B 503) (2 0) Cr 2 Alt S *offered 1995 Prereq 402 or B B 405* Essential elements transport and storage of ions and of O_2 metalloenzymes and metallocoenzymes electron-transfer processes in respiration and photosynthesis metabolism of nonmetals and redox processes involved in it medicinal aspects of inorganic chemistry

505 Physical Inorganic Chemistry (3 0) Cr 3 F *Prereq 402 and 322* Elementary group theory and molecular orbital theory applied to inorganic chemistry Spectroscopic methods of characterization of inorganic compounds

506 Systematic Inorganic Chemistry (3-0) Cr 3 S *Prereq 402 or 500 and 322* Descriptive chemistry of the metallic and nonmetallic elements

510 Advanced Survey of Analytical Chemistry (2 0) Cr 2 F *Prereq 316* Selected topics in modern quantitative analysis including analytical separations titrimetry spectroscopy and other instrumental methods

511 *Advanced Quantitative Analysis* (3-0) Cr 3 S *Prereq 316* General methods of quantitative inorganic and organic analysis Aqueous and nonaqueous titrimetry selective reagents sampling and sample dissolution modern instrumentation and analytical literature

512 Electrochemical Methods of Analysis (3 0) Cr 3 F *Prereq 316 322 and 322L* Principles of convective diffusional mass transport in electroanalysis Applications of potentiometry voltammetry and coulometry Introduction to heterogeneous and homogeneous kinetics in electroanalysis Analog and digital circuitry Interfacing

513 Analytical Molecular and Atomic Spectroscopy (3-0) Cr 3 S *Prereq 316 322 322L* Introduction to physical optics and design of photometric instruments Principles of absorption emission and fluorescence spectroscopy Error and precision of optical methods Ultraviolet visible and infrared methods of qualitative and quantitative organic and inorganic analysis

516 Analytical Separations (3 0) Cr 3 F *Prereq 316 322 322L* Principles and examples of inorganic and organic separation methods applied to analytical chemistry Solvent extraction volatilization ion exchange liquid and gas chromatography

530 Advanced Organic Chemistry (2-0) Cr 2 S *Prereq 332 Selected topics in modern organic* chemistry including structure reaction mechanisms organic synthesis and spectroscopy For students not majoring in organic chemistry

531 Organic Synthesis I (2 0) Cr 2 S *Prereq 332* Survey of organic functional group transformations

532 Organic Synthesis II (2 0) Cr 2 F *Prereq 531* Synthesis of complex organic compounds including natural products

537 Physical Organic Chemistry I (3 0) Cr 3 F *Prereq 332* Molecular structure stereochemistry introduction to reaction mechanisms thermodynamic and kinetic data linear free energy relationships isotope effects orbital symmetry

538 Physical Organic Chemistry II (2-0) Cr 2 S *Prereq 537* Survey of reactive intermediates including cations anions carbenes and radicals

555 Chemical Pedagogy (1-0) Cr 1 F S SS *Prereq Graduate teaching assistantship in chemistry* Policies methods of instruction and practice teaching in undergraduate chemistry recitation discussion and laboratory courses for chemistry graduate teaching assistants

560 Advanced Physical Chemistry (2-0) Cr 2 S Prereq 322 Principles of physical chemistry as they apply to analytical inorganic and organic chemistry including thermodynamics kinetics quantum mechanics and spectroscopy For students not majoring in physical chemistry

561 Molecular Quantum Theory I (4 0) Cr 4 F *Prereq 322* Schrodinger equation and exact solutions square wells and barriers harmonic oscillator the hydrogen atom atomic orbitals operators including angular momenta time independent and time dependent perturbation theory variational method He atom

562 Molecular Quantum Theory II (3 0) Cr 3 S *Prereq 561* Many electron atoms diatomic molecules Born Oppenheimer approximation group theory molecular orbitals orbital optimization and configuration interaction density matrices self-consistent field theory

563 Statistical Mechanics (3 0) Cr 2 or 3 S *Prereq 322* Microscopic and macroscopic properties laws of thermodynamics ensembles and distribution functions applications to gases solids and chemical equilibrium Fundamentals will be covered in the *first 10 weeks for 2 credits* The last 5 weeks will emphasize applications to selected topics such as dense fluids polymers and surfaces (1 credit)

564 Molecular Spectroscopy and Structure (3-0) Cr 3 Alt S offered 1994 *Prereq 505 or 562* Maxwell s field equations interaction of light with matter including time-dependent perturbation theory microwave vibrational (infra red Raman) and electronic spectroscopies symmetry derived selection rules special lineshapes and introduction to nonlinear and coherent laser spectroscopies

570 (470 DL) *Structure and Bonding* (2 0) Cr 2 F *Prereq 322* Graduate study in conjunction with 470 Not available for credit for students who have taken 470

571 *Solid State Chemistry* (3-0) Cr 3 Alt S offered 1995 *Prereq 301 322* A study of solid state materials including structures bonding defects disorder phase transitions ionic mobility metal insulator transitions band theory synthesis and intercalation

572 Spectrometric Identification of Organic Compounds (2 3) Cr 3 F *Prereq 332* Principles of infrared ultraviolet nuclear magnetic resonance and mass spectroscopy as applied to organic chemistry

573 Classical Thermodynamics (2-0) Cr 2 Alt F *offered 1994 Prereq 322* The laws of thermodynamics and their applications to single and multi-component systems heterogeneous and homogeneous equilibria properties of gases condensed phases solutions and surfaces

574 Organometallic Chemistry of the Transition Metals (2-0) Cr 2 Alt S offered 1994 *Prereq 301 332* Transition metal complexes of ligands such as cyclopentadienyl olefins acetylenes benzenes and carbon monoxide Homogeneous catalysis

575 Diffraction and Crystal Structure (3-0) Cr 3 Alt F offered 1993 *Prereq 322* X-ray neutron and electron diffraction scattering by electrons atoms and molecules Data collection techniques space group symmetry application of Fourier methods methods of phasing structural amplitudes

576 Surface Chemistry (3-0) Cr 3 F *Prereq 322* Gas surface interactions and techniques of characterization Idealized surface lattices surface tension Wulff plots work function adsorbate-adsorbate interactions 2D phase diagrams diffusion thin film growth adsorption and desorption mechanisms/energetics/kinetics adsorption isotherms vacuum techniques electron and ion based spectroscopies for surface analysis (including AES FIM XPS UPS EXAFS EELS SIMS LEED and STM)

577 Mass Spectrometry (2 0) Cr 2 Alt F offered 1993 *Prereq Permission of instructor* Basic physics instrumentation and chemical applications of mass spectrometry

578 Chemical Kinetics and Mechanisms (2-0) Cr 2 Alt F offered 1994 *Prereq 322* Methods of studying reaction rates and mechanisms inference of mechanisms from rate laws reversible consecu tive and competing reactions chain mechanisms exchange reactions isotope rate effects very rapid reactions acid base catalysis theories of *unimolecular reactions* absolute rate theory

579 Introduction to Research in Chemistry (1 0) Cr R F S Introduction to the various areas of research in chemistry at Iowa State University

580 Introductory Molecular Quantum Mechanics and Spectroscopy (3-0) Cr 3 Alt F offered 1993 *Prereq 316 or 322* Postulates of quantum mechanics Schrodinger equation simple and exactly soluble model systems *with spectroscopy* relevant to real systems symmetry and the transition dipole atomic spectroscopy chemical bonding of diatomic and polyatomic molecules semi empirical methods introduction to vibrational and electronic spectroscopies For students not majoring in physical chemistry

581 Principles of Lasers and Optics (3 0) Cr 3 Alt S *offered 1995 Prereq 322 Phys 222 Students with weak background are encouraged to take Chem 580* For students working with lasers and optics stimulated adsorption and emission based on the classical electron oscillator model population inversion laser amplification laser pumping oscillation and cavity modes laser beam characterization linear propagation design of laser resonators ray and wave optics nonlinear optics

599 Nonthesis Research Cr arr *Prereq Permission of staff member concerned*

Courses for Graduate Students, major or minor

600 Seminar in Inorganic Chemistry (1-0) Cr 1 each time taken F S *Prereq Permission of instructor*

601 Selected Topics in Inorganic Chemistry (1 0 or 2 0) Cr 1 or 2 F S *Prereq Permission of instructor* Topics such as molecular structure and bonding organometallic compounds physical techniques of structure determination nonaqueous solutions Zintl phases transition metal oxides free radical reactions electron transfer reactions metal metal bonding and bioinorganic chemistry of nucleic acids

611 Seminar in Analytical Chemistry (1-0) Cr 1 each time taken F S

619 *Special Topics in Analytical Chemistry* (2-0) Cr 2 each time taken F S *Prereq Permission of instructor* Raman spectroscopy sensors spectroelectrochemistry capillary electrophoresis analytical plasmas chemometrics and bioanalytical chemistry

631 Seminar in Organic Chemistry (1 0) Cr 1 each time taken F S *Prereq 537 permission of instructor*

632 Selected Topics in Organic Chemistry (1-0) Cr 1 each time taken F S *Prereq 537* Topics of current interest in organic chemistry such as spectroscopy physical organic chemistry photochemistry organometallic chemistry mechanisms of oxidations and reductions modern organic synthesis and reactive intermediates

660 Seminar in Physical Chemistry (1-0) Cr 1 each time taken S *Prereq Permission of instructor*

667 Special Topics in Experimental Physical Chemistry (2 0) Cr 2 each time taken F S *Prereq Permission of instructor* Advanced and recent developments in experimental physical chemistry are selected for each offering

668 Special Topics in Theoretical Physical Chemistry (2-0) Cr 2 each time taken F S *Prereq Permission of instructor* Advanced and recent developments in theoretical physical chemistry are selected for each offering

699 Research *Prereq Permission of staff member concerned*

Civil Engineering

(Administered by the Department of Civil and Construction Engineering)

Lowell F Greimann Chair of Department

Professors Austin Brewer Cleasby Dague Greimann Jeyapalan Kannel Kao Klaiber Lee Lohnes Maze Oulman Porter, Sanders

Emeritus Professors Baumann Carstens Demirel Ekberg Handy Hardy Hoover Jellinger Lubsen Mashaw Mickle Morgan Patterson Ring

Associate Professors Abendroth, Baenziger Bergeson Cable Chase Dunker Fanous Jones Pitt Ringwald Rowings Wipf

Emeritus Associate Professors Fung Sheeler Ward

Assistant Professors Federle Jaselskis Kilgour Straszheim Wall

Undergraduate Study

For undergraduate curriculum in civil engineering leading to the degree bachelor of science see *College of Engineering Curricula*

Civil engineering consists of the economic application of the laws forces and materials of nature to the planning design construction maintenance and operation of public and private facilities Commonly included are transportation systems bridges and buildings water supply pollution control irrigation and drainage systems river and harbor improvements dams and reservoirs Civil engineering also includes the planning design and responsible execution of surveying operations and the location delimitation, and delineation of physical and cultural features on the surface of the earth Research testing sales management and related functions are also a part of civil engineering Work on the campus is supplemented by inspection trips which furnish an opportunity for firsthand study of engineering systems in operation as well as projects under construction

Because of the widespread use of microcomputers throughout civil engineering practice the department has incorporated microcomputer applications into many of the civil engineering courses to provide appropriate learning experiences Students enrolled in civil engineering courses can expect that their use of microcomputers will continue to increase over the next few years

Graduate Study

The Department of Civil and Construction Engineering offers the master of science and doctor of philosophy degrees with a major in civil engineering with areas of specialization in structural engineering environmental engineering construction engineering and management geotechnical engineering civil engineering materials transportation engineering and geometronics The department also offers minor work to students taking major work in other departments

Candidates for the degree master of science are required to satisfactorily complete 30 credits of acceptable graduate work including preparation of a thesis or the completion of a creative component in lieu of a thesis

The department strongly recommends that all candidates for the degree doctor of philosophy demonstrate a significant level of proficiency in one of the following languages French German Russian or Spanish However with the approval of a doctoral candidate s program of study committee 6 additional credits of coursework outside the Department of Civil and Construction Engineering may be substituted for a language requirement

The normal prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of engineering students at this university However because of the diversity of interests within the graduate programs in civil engineering a student may qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering Supporting work will be required depending upon the student s background and area of interest A prospective graduate student is urged to specify the degree program in which he or she is interested on the application for admission

The department participates in the interdepartmental majors in transportation planning (M S only) and water resources and in the interdepartmental minors in mineral resources and technology and social change (See *Index*)

Open to graduate students for minor graduate credit only all 300 and 400 level courses except 336 397 398 438 439 490 and 498

Courses Primarily for Undergraduate Students

101 Technical Lecture (1-0) Cr R F Discussion of various phases of civil engineering For transfer students only Evaluation of transfer credits and discussion of graduation requirements

211 Fundamentals of Surveying I (2 3) Cr 3 F S *Prereq Math 165 or Math 175 Engr 160* Introduction to error theory Fundamentals of observing distances elevations and angles Traversing Irregular areas Circular parabolic and spiral curves Earthwork including mass diagrams Construction staking Computer applications Materials fee

214 Fundamentals of Surveying II (2 3) Cr 3 F S *Prereq 211* Triangulation State Plane Coordinate Systems Astronomic observation for direction Introduction to mapping photogrammetry and global positioning systems Introduction to land surveys Computer applications Materials fee

215 Basic Surveying (1 3) Cr 2 F *Prereq Competence in algebra and trigonometry* Fundamentals of observing distances elevations and angles Traversing Irregular areas Earthwork volumes Circular and parabolic curves Construction staking Materials fee Not available for graduation credit in civil or construction engineering

295 The Practice of Civil Engineering (1-0) Cr 1 F S Practice of civil engineering in various agencies of government and in private practice Continuing education professional ethics and personnel recruitment Various civil engineering projects presented discussed and visited Field trip fee Materials fee

298 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

317 Land Surveying (2 3) Cr 3 S *Prereq 211* Legal principles affecting the determination of land boundaries public domain survey systems Locating sequential and simultaneous conveyances Record research plat preparation and land description Study of selected court cases Materials fee

326 Principles of Environmental Engineering (2 2) Cr 3 F S *Prereq Chem 167 Math 166 credit or enrollment in E M 378* Introduction to environmental problems water quality parameters and requirements potable water quality and quantity objectives water sources and treatment methods water pollution control objectives and treatment methods survey of solid and hazardous waste management and air pollution control Materials fee

332 Structural Analysis I (2 2) Cr 3 F S *Prereq E M 324* Loads shear moment and deflected shape diagrams for framed structures Approximate methods Displacement calculations Flexibility and stiffness methods Computer applications Moment distribution Influence lines and Muller-Breslau principle Materials fee

333 Structural Steel Design I (2 2) Cr 3 F S *Prereq 332 E M 327* Design and behavior of the elements of steel structures proportioning members and connections Emphasis on load and resistance factor design and treatment of allowable stress design Preliminary design of building frames Materials fee

334 Reinforced Concrete Design I (2 2) Cr 3 F S SS *Prereq 332 E M 327* Analysis and design of beams one-way slabs and columns Preliminary design of building frames using pattern loading and moment coefficients Materials fee

336 Structures for Architects I (2 2) Cr 3 S *Prereq E M 241* Review of statically determinate beam and truss analysis Introduction to structural systems wood masonry steel and concrete structures Loading analysis preliminary design of elements of timber structures including beams columns truss members bracing members and connections Use of current structural design specifications This course cannot be used for credit toward graduation in civil engineering Materials fee

350 Introduction to Transportation Planning (3-0) Cr 3 F *Prereq 3 credits in statistics junior classification* Planning of urban and regional transportation systems Applications of population land use economic social and travel studies to problems of transportation system configuration and route location Organization and coordination of the transportation planning function Materials fee Not available for graduation credit for students in civil engineering

352 Introduction to Transportation Engineering (2 3) Cr 3 F S *Prereq 211 295 Phys 221 a course in statistics from approved department list* Introduction to planning and design of highway air and rail transportation facilities Technological and economic factors Route location surveys with spirals Suggested for engineering students only Materials fee

360 Soil Engineering (2-3) Cr 3 F S *Prereq Geol 201 credit or enrollment in E M 324* Introduction to soil engineering and testing Identification and classification tests soil structure soil mineralogy soil water systems and interactive forces principles of settlement shearing stresses in soils and shear strength testing embankments retaining walls foundations piles and underground conduits Materials fee

372 Engineering Hydrology and Hydraulics (2-4) Cr 4 F S *Prereq E M 378 a course in statistics from approved department list* The hydrologic cycle precipitation infiltration runoff evapotranspiration groundwater and streamflow Hydrograph analysis flood routing frequency analysis and urban hydrology Applied hydraulics including pipe and channel flow with design applications in culverts pumping water distribution storm and sanitary sewer systems Materials fee

382 Design of Concretes and Pavement Structures (1 6) Cr 3 F S *Prereq 360* Physical and chemical properties of bituminous portland and other cements aggregate properties and blending mix design and testing of concretes admixtures mixing handling placing and curing soil stabilization soil bearing values application of soil engineering to subgrades pavement thickness design Materials fee

383 Design of Portland Cement Concrete (1 6) Cr 1 F S 5 weeks *Prereq 360 For Con E students only* Physical and chemical properties of portland cement and p c concrete Mix design and testing of p c concrete Materials fee

397 Engineering Internship Cr R F S *Prereq Permission of department chair* One semester maximum per academic year professional work period

438 Structures for Architects II (2 2) Cr 3 F *Prereq 336* Approximate and exact methods of indeterminate beam and frame analysis Loading analysis and preliminary design of elements of steel structures including beams columns truss members bracing members and connections Use of current structural design specifications This course cannot be used for credit toward graduation in civil engineering Materials fee

439 Structures for Architects III (2 2) Cr 3 S *Prereq 336* Approximate and exact methods of indeterminate beam and frame analysis Loading analysis and preliminary design of elements of reinforced concrete structures including beams one way slabs columns and footings Use of current structural design specifications This course cannot be used for credit toward graduation in civil engineering Materials fee

446 Bridge Design (2-2) Cr 3 Alt S offered 1995 *Prereq 333 334* Bridge design in structural steel and reinforced concrete Application of AASHTO Bridge Design Specifications Analysis techniques for complex structures Preliminary designs include investigating alternative structural systems and materials Final designs include preparation of design calculations and sketches Materials fee

447 Building Design (2 2) Cr 3 Alt S offered 1994 *Prereq 333 334* Building design in structural steel and reinforced concrete Investigation of structural behavior of frameworks Lateral load resisting systems Application of current building codes and design specifications Review of building designs Preliminary designs include investigating alternative structural systems Final designs include preparation of design calculations and sketches Materials fee

451 Urban Transportation Planning and Management (2 3) Cr 3 S *Prereq 350 or 352* Planning of highway systems and terminals as part of a complete planning approach public transportation system planning transportation planning studies projections analysis plan formulation and programming Transportation system management models concepts and methods Individual and group projects Materials fee

452 Highway Design (2-3) Cr 3 F S *Prereq 352 372 382 I E 304* Design construction and maintenance of highway facilities earthwork drainage structures pavements Preparation of environmental impact statement A complete design project is required Materials fee

460 Foundations (3-0) Cr 3 F S *Prereq 360* Fundamentals of foundation engineering Exploration sampling and in situ tests Shallow and deep foundations Settlement and bearing capacity analyses Foundation soil improvement Stability of excavations and earth retaining structures Materials fee

486 Engineering Design (2 2) Cr 3 F S *Prereq 326 333 or 334 credit or enrollment in 452* The engineering design process case histories of design inadequacies environmental impact safety and health in the work place cost estimating planning and scheduling and synthesis of previous coursework using a group project Materials fee

490 Independent Study By conference Cr 1 to 6 F S *Prereq Permission of instructor* Independent study in any phase of civil engineering Pre-enrollment contract required
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates*

501 Preconstruction Project Engineering and Management (3 0) Cr 3 F *Prereq Con E 221 441* Application of engineering and management control techniques to construction project development from conceptualization to notice to proceed Determinants of construction project success conceptual estimating design and engineering planning for automated construction techniques constructability review procedures materials management value engineering Attendance at Con E colloquium Field trip fee Materials fee

502 *Construction Project Engineering and* Management (3-0) Cr 3 S *Prereq Con E 221 441* Application of engineering and management control techniques to construction projects Construction project control techniques equipment selection and utilization project administration construction process simulation and productivity improvement programs Attendance at Con E colloquium Field trip fee Materials fee

503 Construction Management Functions and Processes (3-0) Cr 3 S *Prereq Con E 221 credit or enrollment in Con E 421* Analysis of critical construction management skills Analysis of organizational systems related to construction management Case studies Analysis of theories of motivation planning leadership organizational change etc as they relate to field construction operations Materials fee

504 Construction Quality Management (3 0) Cr 3 S *Prereq Con E 221 421* Leading theory and principles of quality management and their application to the construction industry Identification of construction industry problems Development of numerical measures for design and construction processes Application of formalized problem solving techniques in a team environment Development of corporate quality plan Customer satisfaction surveys Current practices in the construction industry Materials fee

506 Case Histories in Construction Documents (3 0) Cr 3 F *Prereq Con E 221 credit or enrollment in Con E 421* Study of cases involving disputes claims and responsibilities encountered by management in construction contract documents Analysis of methods of resolving differences among the owner architect engineer and construction contractor for a project Materials fee

507 Construction Finance and Marketing (3 0) Cr 3 F *Prereq Con E 221 credit or enrollment in Con E 421* Analytical concepts and methodologies from modern finance theory and practice Project finance cash flow analysis foreign exchange exposure and innovative financial methods Construction funding processes and project development Functions involved in marketing construction services Need for construction marketing market area and research planning and objectives operations personnel Materials fee

508 Adjustment of Observations (3-0) Cr 3 Alt F offered 1994 *Prereq 211 a course in statistics from approved department list* Theory of errors Error propagation in geodetic and photogrammetric systems Observation and condition equations in least squares adjustment Methods of constraint colloration and multiquadric Practice in the application of theory of least squares to adjustment of observations Error analyses Materials fee

510 Advanced Technologies for Construction (2 2) Cr 3 F S *Prereq Con E 421 Engr 160* Advanced technologies including microcomputer systems management information systems automation technologies computer aided design and expert systems and their application in the construction industry Overview of systems acquisition communications and networking Materials fee

513 Geodetic and Satellite Surveying (2 3) Cr 3 Alt SS offered 1994 *Prereq 211* Triangulation and trilateration observation and computation Precise leveling Electronic distance measuring instrument calibration Geodetic astronomy for latitude and longitude determination Global positioning systems of satellite observation and computation Materials fee

517 Analytical Photogrammetry and Geographic Information Systems (2 3) Cr 3 Alt F offered 1993 *Prereq 211 or For 414* Theory and practice of stereoplotting systems Planning and execution of photogrammetric projects Concepts principles and methods of analytical photogrammetry Creation of digital terrain models and basemaps for geographic information systems (GIS) Use of computer aided design and GIS software Materials fee

518 Physical and Geometric Geodesy (3 0) Cr 3 Alt S offered 1994 *Prereq 513* General theory of geometric and physical geodesy Geometry of geodetic reference surfaces Spherical and cartesian coordinate systems Coordinate transformations Gravity and potential theory Theory of geoidal undulation and deflection of the vertical Spherical harmonic series Materials fee

519 Remote Sensing and Digital Photogrammetry (3-0) Cr 3 Alt S offered 1995 *Prereq 517* Electromagnetic spectrum and theoretical basis of remote sensing Remote sensing systems including multispectral scanners microwave and radar images Image analysis of digital data from various databases using a variety of software packages Observation of strips and blocks of digital data and their adjustment Calibration of photogrammetric systems Materials fee

520 Physical and Chemical Treatment Processes (2 3) Cr 3 F *Prereq 326* Principles and design of physical and chemical processes in the treatment of water includes adsorption ion exchange membrane processes chemical precipitation and aeration and stripping including laboratory exercises and demonstrations Materials fee

521 Environmental Biotechnology Processes (2 2) Cr 3 F *Prereq 326* Fundamentals of aerobic and anaerobic biological processes applied in wastewater treatment solid waste stabilization bioconversion and stabilization of industrial and agricultural waste and bioremediation of contaminated soil and water environments Materials fee

522 *Water Pollution Control Plant Design* (2 3) Cr 3 S *Prereq 520 521* Design of physical chemical and biological systems for the treatment of domestic and industrial wastewaters Materials fee

523 Water Treatment Plant Design (2-3) Cr 3 S *Prereq 372 520* Principles and design of water treatment processes including coagulation flocculation sedimentation filtration disinfection and corrosion control Plant layout and hydraulic considerations laboratory exercises and demonstrations Materials fee

526 Air Pollution Control Technology (2 0) Cr 2 S *Prereq 326* Sources characteristics effects and control of air pollutant emissions from stationary and mobile sources atmospheric chemistry and global impacts contaminant dispersion and modeling including meteorological and climatological aspects control technologies for particulates sulfur and nitrogen oxides unburned hydrocarbons volatile and toxic substances and odors Materials fee

527 Solid Waste Management (2-0) Cr 2 F *Prereq 326* Planning and design of solid waste management systems includes characterization and collection of domestic commercial and industrial solid wastes waste minimization and recycling energy and materials recovery composting incineration and landfill design Materials fee

529 Hazardous Waste Management (3 0) Cr 3 S *Prereq 520 521* Regulatory requirements for the classification transport storage and treatment of hazardous wastes Analysis and design of alternatives for storage treatment and disposal technologies including physical chemical and biological treatment solidification incineration and secure landfill design Regulatory requirements and procedures for hazardous waste contaminated site investigations Analysis and design of remedial action alternatives for site restoration Materials fee

532 Structural Analysis II (3-0) Cr 3 F *Prereq 332 FORTRAN equivalent* Displacements by virtual work unit load Analysis of structural problems by the force and stiffness methods Direct stiffness method for 2 D frames grids 3 D frames General purpose frame programs Materials fee

535 Prestressed Concrete Structures (3-0) Cr 3 F *Prereq 334* Design of prestressed concrete structures hardware stress calculations prestress losses deflections shear design section proportioning special topics Materials fee

536 Masonry and Timber Design (2 2) Cr 3 F *Prereq 334* Behavior and design of clay and concrete masonry beams columns walls and structural systems Behavior and design of timber and laminated timber beams columns connections and structural systems Materials fee Field trip fee

540 Behavior of Reinforced Concrete Structures (3 0) Cr 3 Alt F offered 1993 *Prereq 334* Behavior and strength of reinforced concrete members by reviews of experimental and analytical investigations flexure axial load shear bond torsion combined loadings Materials fee

541 Dynamic Analysis of Structures (3-0) Cr 3 S *Prereq 532 E M 307 or E M 345* Single and multi degree of freedom systems Free and forced vibrations Linear and nonlinear response Modal analysis Response spectra Computer programs for dynamic analysis Seismic design Materials fee

543 Structural Analysis by Finite Elements (3-0) Cr 3 S *Prereq 532* Use of the finite element method for the analysis of complex structural configurations Plane stress plate and shell finite elements General purpose finite element programs Materials fee

544 Limit Design and Structural Optimization (3-0) Cr 3 S *Prereq 333 334* Plastic analysis and design in steel by LRFD and ASD methods Limit analysis and design in reinforced concrete Considerations of hinging and ductility Structural optimization Materials fee

546 Structural Steel Design II (3-0) Cr 3 F *Prereq 333* Development of the AISC design equations for tension members columns beams beam-columns and plate girders by LRFD and ASD methods Elastic and inelastic buckling of members and member elements Torsion of W shapes Composite design Materials fee

547 Analysis and Design of Plate and Slab Structures (3-0) Cr 3 F *Prereq 334 E M 514 Math 266* Bending and buckling of thin plate components in structures utilizing classical and energy methods Analysis of shell roofs by membrane and bending theories Materials fee

548 Classical Analysis Methods (3-0) Cr 3 S *Prereq 332* Displacement computation Moment area conjugate beam Newmark s method energy methods Extension of slope deflection and moment distribution Introduction to cable structures arches frame buckling and moving loads Materials fee

549 Reinforced Concrete Design II (2 2) Cr 3 S *Prereq 334* Design of reinforced concrete long columns floor slabs building frames isolated footings and combined footings Design and behavior considerations for torsion biaxial bending structural joints and shear friction Introduction to cold formed composite steel and composite floor slab design Materials fee

550 Advanced Highway Design (2 3) Cr 3 S *Prereq 452* Rural and urban street and highway design Establishment of design criteria application to street and highway systems and to intersections and interchanges drainage design urban freeway design aspects Noise analysis and other environmental factors Materials fee

552 Traffic Safety Operations and Maintenance (2 2) Cr 3 Alt S offered 1994 *Prereq 352* Engineering aspects of highway traffic safety Reduction of accident incidence and severity through highway design and traffic control Accident analysis Legal implications Safety in highway design maintenance and operation Materials fee

553 Traffic Engineering (2-3) Cr 3 F *Prereq 352* Driver pedestrian and vehicular characteristics Traffic characteristics highway capacity traffic studies and analyses Principles of traffic control for improved highway traffic service and safety Traffic signals signs and markings lighting channelization other traffic control measures Materials fee

555 Economic Analysis of Transportation Investments (3-0) Cr 3 Alt S offered 1994 *Prereq 350 or 352* Application of economic analysis methodologies to evaluate transportation projects Multi-modal approaches to evaluate impacts of transportation investments and maximize economic efficiency while considering equity and other social issues related to investment options Materials fee

556 Air and Public Transportation Facilities (2-3) Cr 3 Alt S offered 1995 *Prereq Credit or enrollment in 452 or admission to Transportation Planning* Airport planning and operation Public transportation planning and terminals Parking lots and terminals Landside and airside aspects of air terminals Design aspects of air and public transportation facilities Materials fee

557 Transportation Systems Analysis (2 3) Cr 3 Alt F offered 1993 *Prereq 451 3 credits in statistics or probability* Travel studies and analysis of data Travel projections Public transportation forecasts and analyses Statewide regional and local transportation system planning Corridor travel planning Optimization of systems Materials fee

558 Transportation Systems Development and Management Laboratory (2-2) Cr 3 each time taken maximum 6 credits Alt F offered 1994 *Prereq 350 or 352* Study of designated problems in traffic engineering urban transportation planning and urban development Forecasting and evaluation of social economic and environmental impact of proposed solutions considerations of alternatives Formulation of recommendations and publication of a report Presentation of recommendations in the host community Materials fee

559 Pavement Maintenance Management (3-0) Cr 3 Alt S offered 1995 *Prereq 352 382* Engineering management techniques for managing pavements Systematic approach to management through pavement life cycle Selection and scheduling of maintenance treatments Analysis of network wide pavement resource needs Selection of strategies for specific pavement projects Materials fee

560 Fundamentals of Soil Mechanics (3-0) Cr 3 F *Prereq 360* Principles of soil mechanics according to limiting stress analysis shear strength of soils under various drainage conditions effective stresses stress distributions from surface loads pore pressure parameters two-dimensional stress paths consolidation applications to slope stability and retaining walls Materials fee

562 Site Evaluations for Civil Engineering Projects (2 2) Cr 3 S *Prereq 360* Identification and mapping of engineering soils from airphotos Use of remote sensing and GIS planning subsurface investigations geomaterials prospecting water resources applications Materials fee

564 Advanced Geotechnical Design (3-0) Cr 3 Alt S offered 1995 *Prereq 560* In situ testing load penetration and field shear tests Materials fee

570 Applied Hydraulic Design (2 3) Cr 3 Alt F offered 1993 *Prereq 372* Flow characteristics in natural and constructed channels principles of hydraulic design of culverts bridge waterway openings spillways hydraulic gates and gated structures pumping stations and miscellaneous water control structures pipe networks mathermatical modeling Design project Materials fee

571 Surface Water Hydrology (3 0) Cr 3 S *Prereq 372* Analysis of hydrologic data including precipitation infiltration evapotranspiration direct runoff and streamflow theory and use of frequency analysis theory of streamflow and reservoir routing use of deterministic and statistical hydrologic models Design project Materials fee

573 Groundwater Hydrology (2 3) Cr 3 F *Prereq 372* Groundwater as a source of municipal industrial and agricultural water supplies location occurrence hydraulics of flow determination of aquifer and well characteristics pumping test analysis well design and pump selection contaminant transport groundwater basin management Materials fee

575 Soil and Groundwater Remediation (3-0) Cr 3 S *Prereq 573* Introduction to the methods used for the treatment of contaminated soil and groundwater technologies covered include pump and treat soil venting air stripping and activated carbon adsorption and in situ bioremediation design of groundwater monitoring systems Materials fee

579 Modeling Groundwater Flow and Pollution (3 0) Cr 3 Alt S offered 1994 *Prereq 573 or Geol 511 Some experience with programming in a high level language (e g FORTRAN etc) is beneficial* Development and use of computer codes for analytical and numerical solution of the governing equations of groundwater flow and contaminant transport Introduction to finite difference finite element methods Applications to analysis and design parameter estimation well field layout and aquifer remediation Materials fee

584 Fundamentals of Geomaterials Behavior (3 0) Cr 3 F *Prereq 6 credits in geotechnical or materials sciences* Atoms and molecules crystal chemistry clay minerals structure of solids phase transformations and phase equilibria Surfaces and interfacial phenomena colloid chemistry mechanical properties Applications to soils and civil engineering materials Overview of state-of the-art instrumental techniques for analysis of the physicochemical properties of soils and civil engineering materials Materials fee

587 Applied Concretes and Pavements (2 3) Cr 3 F *Prereq 382* Advanced portland cement and bituminous concrete mix designs Aggregates Admixtures Production and construction quality control and inspection Nondestructive testing Geomaterials stabilization Pavement thickness design Materials engineering reports Materials fee

588 Advanced Concretes and Materials (2 3) Cr 3 Alt S offered 1994 *Prereq 587* Chemical and physical properties of portland cement and asphalt cement and their effect on concrete properties Physicochemical properties of construction materials Mineral admixtures Concrete durability Materials fee

590 Special Topics Cr 1 to 5 each time elected F S Pre enrollment contract required

591 Seminar in Environmental Engineering (1-0) Cr R F S *Prereq Graduate classification* Offered on a satisfactory fail basis only Contemporary environmental engineering issues Outside speakers Review of ongoing research in environmental engineering

599 Creative Component Cr 1 to 3 Pre enrollment contract required Advanced topic for creative component report in lieu of thesis

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*An undergraduate student must have an academic standing in upper one half of his/her class in order to enroll in any 500 level civil engineering course

Courses for Graduate Students, major or minor

622 Advanced Topics in Environmental Engineering (2-0) Cr 2 F S *Prereq Permission of environmental engineering graduate faculty* Advanced concepts in environmental engineering Materials fee Emphasis for a particular offering will be selected from the following topics
A Water Pollution Control
B Water Treatment
C Solid and Hazardous Waste
D Water Resources

649 Advanced Topics in Structural Engineering (3-0) Cr 3 F S *Prereq Permission of structural engineering graduate faculty* Advanced concepts in structural engineering topics Materials fee Emphasis for a particular offering will be selected from the following topics
A Behavior of Metal Structures
B Design of Concrete Shells
C Cable-Supported Structures
D *Advanced Matrix Analysis of Structures*
E Dynamic Design of Structures
F Reliability Assessment of Structures

660 Applied Foundation Engineering (2 3) Cr 3 F *Prereq 460* Application of foundation engineering principles through guided design and case studies Field investigations in situ testing slope stability foundations on expansive soils and design of shallow and deep foundations Drainage and dewatering underpinning and soil improvement Foundation engineering reports Materials fee

663 Design of Geotechnical Containments (3 0) Cr 3 Alt S offered 1994 *Prereq 560 573* Location selection of materials design and construction of geotechnical containments including earth dams sanitary landfills waste and hazardous waste impoundments Field trip fee Materials fee

690 Advanced Topics Cr 1 to 3 Pre-enrollment contract required

699 Research

Classical Studies

(Interdepartmental Undergraduate Program)

Program Committee M Henry Chair
A Avraamides J Cunnally D Roochnik
J Ruebel

The classical studies program is a cross-disciplinary program in the College of Liberal Arts and Sciences which offers an integrated curriculum of courses in the languages literatures history and thought of ancient Greece and Rome from the time of the Homeric poems to the reign of the Emperor Constantine The program also encourages a perspective on the contemporaries and antecedents of classical culture such as Egypt the Near East and Mycenaean Greece, and on its heirs in the Middle Ages and Renaissance

In addition to fulfilling group requirements and electives for all students courses in classical studies provide significant background for students whose majors are in anthropology, English foreign languages and literatures history music philosophy women s studies or related fields

The program committee will assist students interested in planning an interdisciplinary studies major For details of the requirements for such majors within the College of Liberal Arts and Sciences, see *Liberal Arts and Sciences Cross-Disciplinary Studies*

Completion of one year of classical Greek or Latin (or the equivalent) is a prerequisite to the minor in classical studies A student who wishes to declare a minor must then complete at least the following requirements (a) one additional semester of the same classical language (b) 371, (c) 402 or 403 (d) six additional credits from the courses listed below (primary or departmental) or as approved by the program committee (History majors may substitute 310 for 402 or 403)

Primary Courses

241 The World of Heroes in Greece and Rome (3-0) Cr 3 F Investigation of the concept of the heroic in Greek and Roman epic and other relevant texts Development of the heroic ideal problems entailed by specific texts or kinds of texts The heroic code and its implications for Greco Roman concepts of the nature of humanity problems posed by the heroic code transformations of the code
H Honors (4 0) Cr 4

304 Introduction to Ancient Civilizations (Hist 304) See *History*

310 Ancient Philosophy (Phil 310) See *Philosophy*

353 Western World Literature Ancient through Renaissance (Engl 353) See *English*

371 Greek and Roman Mythology (3 0) Cr 3 F Survey of the legends myths and sagas of the classical world with emphasis on the principal gods demigods and heroes and their implications for ancient social psychological and religious attitudes some attention given to important modern theories

372 Greek and Roman Tragic Drama (3-0) Cr 3 S Origin and development of Athenian tragic drama and its imitation at Rome selected readings in English from Aeschylus Sophocles Euripides and Seneca ancient theater and dramatic conventions theories of tragedy

374 Women in Classical Antiquity (W S 374) (3-0) Cr 3 S *Examination of the status of women in classical antiquity and other constructs of the female in classical antiquity* Chronological limits Bronze Age Greece to Early Imperial Rome

402 403 Ancient Greece and Rome (Hist 402 403) See *History*

490 Independent Study Cr 1 to 6 each time taken *Prereq 7 credits in classical studies at the 200 level or higher permission of the chair of the program committee* Designed to meet the needs of students who wish to study specific topics in classical civilization in areas where courses are not offered or to pursue such study beyond the limits of existing courses

512A Proseminar in Ancient European History (Hist 512A) See *History*

594A Seminar in Ancient European History (Hist 594A) See *History*

Primary Courses (Offered by Other Departments)

Art 383 Greek and Roman Art See *Art and Design*

Greek 101 102 Elementary Classical Greek See *Foreign Languages and Literatures*

Greek 201 Intermediate Classical Greek See *Foreign Languages and Literatures*

Greek 342 Introduction to Classical Greek Literature See *Foreign Languages and Literatures*

Hist 280 Introduction to the History of Science See *History*

Latin 101 102 Elementary Latin See *Foreign Languages and Literatures*

Latin 201 Intermediate Latin See *Foreign Languages and Literatures*

Latin 306 Composition and Oral Interpretation See *Foreign Languages and Literatures*

Latin 342 Introduction to Latin Literature See *Foreign Languages and Literatures*

Latin 441 442 Advanced Readings in Latin See *Foreign Languages and Literatures*

Pol S 430 Development of Political Thought Classical Thought through Early Contract Theory See *Political Science*

Sp Cm 510 Classical Rhetoric See *Speech Communication*

Community and Regional Planning

Eric Damian Kelly Chair of Department

Professors Kelly Kihl Mahayni Shinn

Associate Professors Hembd Huntington Knox Lex

Emeritus Associate Professor Malone

Assistant Professor Burgess

Undergraduate Study

For undergraduate curriculum in community and regional planning leading to the degree bachelor of science see *College of Design Curricula*

Community and regional planning is concerned with the economic social environmental, psychological and management aspects of change in a geographic or political area The planner must attain a broad comprehension of city metropolitan urban rural regional, and statewide types of development their interrelationships and the extent of their changing needs over the short term and the middle- and long-range future

The curriculum is accredited by the Planning Accreditation Board of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning thus providing the student with an education which when combined with experience supports the individual s eligibility for membership in the American Institute of Certified Planners

The department cooperates in the undergraduate minors in design studies and environmental studies

Graduate Study

The department offers work for the master of community and regional planning degree with areas of concentration in housing urban design, planning management and implementation planning in developing countries, social planning transportation planning, environmental planning community and rural development land use planning and urban and regional information systems

Degree requirements include completion of a 2-year 48-credit program including a thesis of 9 credits Minor work is offered in transportation planning housing mineral resources and technology and social change (see *Index*)

The program of graduate study is accredited by the Planning Accreditation Board of the American Institute of Certified Planners and the Association of Collegiate Schools of Planning

The planning core consists of Stat 401 C R P 511 519 520 522 532 561 570 and 591 or 592

Note for CRP 519 520 522 All CRP students are required to take a total of 9 credits with the required modules as CRP 519A 519C 520A 522A 522B and 520B or 522E and 520C or 520D and any other modules to meet the 9 credit requirement

No foreign language is required for the degree master of community and regional planning

Satisfactory completion of the core requirements and the acceptance of a thesis (9 credits) are required for the M C R P degree In addition the student is encouraged to complete three months of acceptable work experience in a planning office between the first and second year of study

Double degree programs are offered with architecture (M C R P/M Arch) public administration (M C R P /M P A) and landscape architecture (M C R P /M L A) The department participates in the interdepartmental minors in housing mineral resources and technology and social change and in the interdepartmental major in transportation planning

Open to graduate students for minor credit only 380 451

Courses Primarily for Undergraduate Students

253 Survey of Community and Regional Planning (3-0) Cr 3 F A historical survey of planning the nature and problems of urban areas and the goals procedures and results of urban planning

270 Forces Shaping Our Metropolitan Environment (3-0) Cr 3 S *Must be taken prior to 9 credits in CRP* Introduction to the social political physical and economic forces as they shape metropolitan areas and their interrelationships A comprehensive picture of metropolitan development showing important roles other urban disciplines play in the planning process and the interrelationships of the disciplines

272 Planning Analysis and Techniques I (2 1) Cr 3 S Existing and emerging techniques for preparation of community planning studies Sources of planning information and data Survey techniques including survey instruments sampling methods sample size for demographic studies Land use surveys for comprehensive and transportation planning Student s oral and graphic presentation of analytical results

274 Planning Analysis and Techniques II (2 1) Cr 3 F *Prereq 272* Use of quantitative methods for analysis of population land use economic and transportation make up of a community activities and location intensity and timing of land uses and public services Student s oral and graphic presentation of analytical results

293 Environmental Planning (Env S 293) (3 0) Cr 3 F *Prereq Sophomore classification* Comprehensive overview of the field of environmental relationships and the efforts being made to organize control and coordinate environmental aesthetic and cultural characteristics of land air and water

***315 (515 DL) Housing** (3-0) Cr 3 F *Prereq 253 or 270* An in-depth review of the problems and issues related to housing planning and policy dealing primarily with inter relationships and interdependencies among the socio cultural economic and physical aspects of housing Analysis of housing policy making processes in the U S a comparative review of the housing policy and planning systems in selected developed and developing nations

***317 (517 DL) Urban Revitalization** (3 0) Cr 3 Alt S offered 1994 *Prereq 253 or 270* The nature extent causes and theories of urban decline Relationship between neighborhood change and the urban development process public policy implications Planning methods utilized to further revitalization and preservation efforts

***318 (518 DL) Graphic Communications in Planning** (3-0) Cr 3 S *Prereq 253 or 270* Introduction to computer graphics for majors in planning Graphics as a means of conceptualizing ideas and communicating information Use of Macintosh software primarily supplemented with Ulti-Map on Apollo work stations and MS/DOS graphics on IBM/PC compatible computers

***325 (525 DL) Growth Management** (3-0) Cr 3 S *Prereq Junior classification* Techniques used to manage growth related change and to implement plans Capital investment strategies public land acquisition and protection development impact analysis impact mitigation including impact fees phased growth systems urban/suburban/rural relationships land preservation specific problem areas such as regulation around airports and locations of quarries and waste disposal sites

330 Practicum Cr 1 to 6 may be repeated up to a maximum of 6 credits F S SS *Prereq Major in community and regional planning* Structured work experience under close supervision of a professional planner Practical planning experience relationships between theory and practice professional responsibilities and the scope of various planning roles Practicum may be repeated Offered on a satisfactory fail basis only

***342 (542 DL) Site Analysis and Development Design** (3-0) Cr 3 S *Prereq 253 272* Introduction to site analysis using landscape architecture and environmental principles but drawing also on basic engineering concepts Work will evolve from analysis to land development design based on that analysis Not open to students with more than 12 credits in LA

***355 (555 DL) Community Economic Development** (3 0) Cr 3 S *Prereq Sophomore classification* The nature and process of economic development in the context of community development Recent changes and trends and their implications for local and regional development Selected case studies and applications Contemporary community economic development issues

***365 (565 DL) Technology Design Professions and the Development of Urban Space** (3-0) Cr 3 F *Prereq Completion of one semester in a design engineering social science or history major* Historical development of urban areas and their change over time Impact of technological change on development the role that technical and design professionals (including civil engineers architects landscape architects and city planners among others) have played

380 Regional and State Planning (3-0) Cr 3 Alt S offered 1994 *Prereq 253 or 270* Analysis of theories policies and functions at the metropolitan regional and state levels with emphasis on area wide governance structures and strategies for guiding development

383 Theory of the Planning Process (3-0) Cr 3 S *Prereq 253 or 270* The nature of planning and its relation to social and economic planning levels of planning place of planning in decision making steps in the planning process uses and limitation of knowledge in planning relation of facts and values

***416 (516 DL) Urban Design and Planning Practice** (3 1) Cr 4 F *Prereq 253 or 270* Principles of urban design and their application to residential and commercial development Review processes and criteria for subdivision design and site planning

***427 (527 DL) Social Policy Planning** (3-0) Cr 3 Alt S offered 1995 *Prereq 253 270 or junior classification* An overview of the theory and methods of social policy planning with particular attention given to the spatial relationships of policy formation allocation of scarce resources and the delivery of public services as an integrated part of comprehensive community planning

432 Urban Development Planning and Programming (1-9) Cr 4 F S SS *Prereq 272 274 senior classification* Collaboration in the comprehensive planning process for a specific geographic area Application of analytical method s in preparing a plan Preparation of effectuating devices such as revitalization projects codes ordinances and capital improvement programs

***434 (534 DL) Small Town and Rural Development Planning** (3-0) Cr 3 F *Prereq 253 or 270* Contemporary planning problems in small towns and their rural regions Strategies built upon decentralization of planning functions agricultural land preservation retail sales recapture business development and retention Comparisons of First and Third World examples

451 Introduction to Geographic Information Systems (2 2) Cr 3 S Introduction to geographic information systems and contributing disciplines Technical issues map coordinates rasters vectors databases analysis visualization and data display Application issues areas decision-making planning implementation and standards Laboratory includes software demonstrations rastermap analysis and topological structures in vector systems

***475 (575 DL) Urban Planning/Urban Management** (3 0) Cr 1 for each module 5 weeks each F *Prereq 253 or 270 and junior classification* The role planning plays as a part of the management and decision making process policy initiation development and implementation management approaches and tools
A Urban Planning and Management
B Citizen Participation/Conflict Management
C Grant Writing

490 Independent Study Cr 1 to 3 F S SS *Prereq Written approval of instructor and department chair on required form* Investigation of an approved topic commensurate with student s interest and ability Offered on a satisfactory/fail basis only
H Honors

***491 (591 DL) Environmental Law** (Env S 491) (3 0) Cr 3 S *Prereq 6 credits in natural sciences* Legal precedents and alternative policies for environmental protection rights to and regulations for uses of water air and land Federal environmental control acts and leading federal court cases

***492 (592 DL) Planning Law Administration and Implementation** (3-0) Cr 3 F *Prereq Junior classification and 253 or 270* The basis in constitutional common and statutory law for the powers of plan effectuation Problems of balancing public and private interests as revealed in the study of leading court cases Administration of planning agencies and programs

*See page 119 for information on dual listed courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

511 Introduction to Community and Regional Planning (3-0) Cr 3 F *Prereq Graduate classification* Development of planning in the United States history and evolution of the planning profession and constructs of current practice Theoretical basis of planning

***515 (315 DL) Housing** (3 0) Cr 3 F *Prereq Permission of instructor and graduate classification* An in-depth review of the problems and issues related to housing planning and policy dealing primarily with interrelationships and interdependencies among the socio-cultural economic and physical aspects of housing Analysis of housing policy making processes in the U S a comparative review of the housing policy and planning systems in selected developed and developing nations

***516 (416 DL) Urban Design and Planning Practice** (3 1) Cr 4 S *Prereq Graduate classification* Principles of urban design and their application to residential and commercial development Review processes and criteria for subdivision design and site planning

***517 (317 DL) Urban Revitalization** (3 0) Cr 3 Alt S offered 1994 *Prereq Graduate classification* The nature extent causes and theories of urban decline The relationship between neighborhood change and the urban development process and its public policy implications the planning methods utilized to further revitalize preservation efforts

***518 (318 DL) Graphic Communications in Planning** (3 0) Cr 3 S *Prereq Graduate classification* Introduction to computer graphics for majors in planning Graphics as a means of conceptualizing ideas and communicating information Use of Macintosh software primarily supplemented with Ulti Map on Apollo work stations and MS/DOS graphics on IBM/PC compatible computers

519 Introduction to Planning Methods (3 0) Cr 1 per module F S Modules lasting 5 weeks each *Prereq Graduate classification* Basic foundations of planning methods sources of planning data planning surveys geographic information system computer applications to planning methods and the process of generating the comprehensive plan
A Planning Information Systems
B Geographic Information Systems
C Computer Applications to Planning Methods

520 Planning Methods (3 0) Cr 1 per module F Modules lasting 5 weeks each *Prereq 519 A 519C and graduate classification* Planning analysis of demographic trends land use transportation utilities and public facilities systems and code administration and enforcement
A Population Projection and Demographic Analysis
B Land Use
C Transportation Planning
D Utilities and Public Facilities
E Codes Administration and Enforcement

522 Advanced Planning Methods (3 0) Cr 1 per module S Modules lasting 5 weeks each *Prereq 519A 519C graduate classification* The economic make up of a community and its analysis economic and multi-goal evaluation analysis and financing of public projects environmental analysis and project review
A Urban and Regional Economic Analysis
B Economic Analysis of Public Projects
C Multi Goal Evaluation of Public Projects
D Financing Urban Change Projects
E Environmental Analysis
F Project Review

***525 (325 DL) Growth Management** (3-0) Cr 3 S *Prereq Graduate classification* Review of techniques used to manage growth related change and to implement plans Capital investment strategies public land acquisition and protection development impact analysis impact mitigation including impact fees phased growth systems urban/suburban/rural relationships land preservation specific problem areas such as regulation around airports and location of quarries and waste disposal sites

***527 (427 DL) Social Policy Planning** (3 0) Cr 3 Alt S offered 1994 *Prereq Graduate classification* The theory and methods of social policy planning with particular attention to the spatial relationships of policy formation allocation of scarce resources and the delivery of public services as an integrated part of comprehensive community planning

529 Planning in Developing Countries (3 0) Cr 3 Alt S offered 1994 *Prereq Graduate classification* A variety of planning and planning related issues including rural urban migration development of national policies and programs urban decay rural development strategies housing problems in a developing country

530 Practicum Cr 1 to 3 may be repeated up to a maximum of 3 credits F S SS *Prereq Graduate classification in community and regional planning* Practical planning experience Structured work in range of varied tasks under close supervision of a professional planner Relationships between theory and practice exposure to variety of roles in functioning specialties Offered on a satisfactory fail basis only

532 Community and Regional Planning Workshop (1 9) Cr 4 S *Prereq 519 520 522* Integration of planning methods and theory in dealing with a community planning problem Analysis of problem and formulation of strategies for implementation Preparation of a community planning report

***534 (434 DL) Small Town and Rural Development Planning** (3-0) Cr 3 F *Prereq 511 or 529* Contemporary planning problems in small towns and their rural regions Strategies built upon decentralization of planning functions agricultural *land preservation retail sales recapture business* development and retention Comparisons of First and Third World examples

***542 (342 DL) Site Analysis and Development Design** (3-0) Cr 3 S *Prereq Graduate classification* Introduction to site analysis using landscape architecture and environmental principles basic engineering concepts Work will evolve from analysis to land development design based on that analysis Not open to students with more than 12 credits in LA

545 Seminar in Housing and Urban Development Administrative Policies (1 0) Cr 0 5 each time taken F S *Prereq Participation in HUD work/study program* Comparative administrative and planning practices evidenced through the experiences afforded by planning internships in housing and planning agencies Theoretical perspectives of planning and planning methods assessed in light of real world experience

***555 (355 DL) Community Economic Development** (3 0) Cr 3 S *Prereq Graduate classification* The nature and process of economic development in the context of community development Recent changes and trends and their implications for local and regional development Selected case studies and applications Contemporary community economic development issues

556 Economic Development in Small Communities Cr 1 F Offered off campus through Continuing Education on two consecutive Fridays and Saturdays *Prereq Permission of instructor* Community development perspectives entrepreneurial approaches leadership theories total quality management concepts and strategic planning skills

561 Seminar in Planning Theory (3-0) Cr 3 S *Prereq Permission of instructor and graduate classification* Current planning theories comprehensive land use advocacy participatory radical and transactive planning models Decision making and organization models as they affect planning practice Value conflicts and conflict resolution

***565 (365 DL) Technology Design Professions and the Development of Urban Space** (3-0) Cr 3 F *Prereq Graduate classification* Historical development of urban areas and their change over time Impact of technological change the role that technical and design professionals (including civil engineers architects landscape architects and city planners among others) have played

570 Seminar in Planning Research (1 0) Cr 1 F S *Prereq Graduate classification in community and regional planning* Topics vary from year to year Emphasis on planning research methods and development of research proposals

***575 (475 DL) Urban Planning/Urban Management** (3-0) Cr 1 per module 5 weeks each F *Prereq Graduate classification* The role planning plays as a part of the management and decision making process policy initiation development and implementation management approaches and tools includes modules on citizen participation/conflict management and grant writing
A Urban Planning Urban Management
B Citizen Participation/Conflict Management
C Grant Writing

580 Seminar in Regional Planning and Development (3 0) Cr 3 Alt F offered 1993 *Prereq Graduate classification* Regional development issues and policies in advanced and developing countries Theories and methods distribution of economic activities and settlement patterns Role of infrastructure in development

590 Special Topics Cr 1 to 3 F S SS *Prereq Graduate classification and written approval of instructor and department chair on required form*
A Planning Administration
B Local Economic Development
C Urban Design
D Housing
E Neighborhood Renewal
F Social Planning
G Regional Economic Development
H Environmental Planning
I Transportation Planning
J Policy Analysis
K State Planning
L Planning in Developing Countries

***591 (491 DL) Environmental Law** (3-0) Cr 3 S *Prereq Graduate classification* Legal precedents and alternative policies for environmental protection rights to and regulations for uses of water air and land Federal environmental control acts and leading federal court cases

***592 (492 DL) Planning Law Administration and Implementation** (3 0) Cr 3 F *Prereq Graduate classification* The basis in constitutional common and statutory law for the powers of plan effectuation Problems of balancing public and private interests as revealed in the study of leading court cases Administration of planning agencies and programs

Courses for Graduate Students, major or minor

699 Research Cr var F S SS Computer fee

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*See page 119 for information on dual-listed courses

Computer Engineering

(Administered by the Department of Electrical Engineering and Computer Engineering)

Randall L Geiger Chair of Department

Professors Anderson Basart Brearley Brockman Burns Comstock Dalal Fouad Geiger Hillesland Horton Hsieh Jiles Jones Lamont Lord Papadakis Post Smay Swift S Upda Vittal Wright

Emeritus Professors Brown Fanslow Hale Koerber Kopplin Nilsson Pohm Potter Read Stewart Townsend Triska

Associate Professors Bond Carlson Davis Hester Jacobson, Kleitsch Kruempel Pavlat Russell Sheblé Stephenson Weber

Emeritus Associate Professors Coady McMechan Mericle Scott

Assistant Professors Ajjarapu Chen Davidson Doherty Han Hassoun Hung Khammash Lusk McCalley Patterson Ramabadran Sapatnekar Tuttle, L Udpa

Instructor West

Undergraduate Study

For undergraduate curriculum in computer engineering leading to the degree bachelor of science see *College of Engineering Curricula*

Computer engineers engage in research development design application management and sales in the computer industry and in a broad range of industries in which digital systems and subsystems have application Computer engineers apply the theories and technology of computing and computers toward improvements in all the range of computing systems and devices that render a service to society

The department offers a cooperative education program that combines classroom learning at the university with practical engineering experience in industry Students in this five-year program complete the regular curriculum requirements for the bachelor of science degree and acquire carefully planned and supervised work experience at one of the cooperating companies The first contact with industry comes after the sophomore year See *College of Engineering Cooperative Programs*

Credit in 440 may not be counted toward a degree in computer engineering

Credit in only one course in each of the following pairs of courses may be counted toward graduation 321 and 440 389 and 440

Graduate Study

The department offers work for the degrees master of science master of engineering and doctor of philosophy with major in computer engineering and minor work to students with other majors Minor work for computer engineering majors is usually selected from a wide range of courses outside computer engineering The department also participates in the technology and social change interdepartmental minor

The degree master of science requires a thesis and is recommended for students who intend to continue toward the doctor of philosophy degree or to undertake a career in research and development The nonthesis master of engineering degree requires a creative component

The normal prerequisite to major work in computer engineering is the completion of undergraduate work substantially equivalent to that required of computer engineering students at this university It is possible for a student to qualify for graduate study in computer engineering even though the student s undergraduate or prior graduate training has been in a discipline other than computer engineering Supporting work if required will depend on the student s background and area of research interest Prospective students from a discipline other than computer engineering are required to submit with the application for admission a statement of the proposed area of graduate study

The department requires submission of GRE aptitude test scores by applicants from other countries All students whose first language is not English and who have no U S degree must submit TOEFL examination scores Ph D students must pass a department qualifying examination

Courses open to graduate students for minor credit only all 300 and 400 level courses except 310 384 481 482 and 490

Courses Primarily for Undergraduate Students

280 Introduction to Digital Techniques (3-0) Cr 3 F S *Prereq Sophomore classification* Number systems and codes Introduction to Boolean algebra Combinational and sequential logic design Digital systems design examples

281 Introduction to Digital Systems Design (2 3) Cr 3 F S *Prereq 280 credit or enrollment in E E 235* Logic signals and gates Logic families Use of basic instruments such as logic probes and logic analyzers Introduction to computer-aided schematic capture simulation and PLD design tools Documentation standards Implementation and testing of combinational and sequential systems and subsystems Individual design projects

298 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

310 Theoretical Foundations of Computer Engineering (3-0) Cr 3 F S *Prereq Math 267* Foundational material for the study of computer codes computer arithmetic digital circuit design computer system performance and memory systems Discrete mathematics probability and statistics linear algebra Applications to computer engineering

***321 Introduction to Computer Architecture and Machine Level Programming** (Com S 321) (3 2) Cr 4 F S *Prereq Credit or enrollment in 280 and either Com S 107 or 207 or 227* Introduction to computer architecture with emphasis on instruction sets and addressing modes Machine level programming including assembly language Techniques for improving program performance Input/output and interrupts Laboratory based introduction to modern development tools and performance measurement systems

384 Computer Organization and Design I (Com S 384) (3 0) Cr 3 F S *Prereq 280 321* Introduction to computer organization including micro programmed and hardwired control units instruction set design memory and bus structures computer arithmetic cache memories overlapped instruction execution and selected advanced topics such as RISC computers and multiprocessor architectures

***389 Introduction to Design of Computer Based Systems** (3 3) Cr 4 F S *Prereq 281 321 credit or enrollment in E E 436* Use of microcomputers as system components Digital and non-digital interfacing Examination of the role of standard system buses and standard interfaces Use of advanced system development tools e g emulators software performance analyzers state and timing analyzers in both assembly language and high level language environments Laboratory oriented design projects

397 Engineering Internship Cr R F S *Prereq Permission of department* One semester maximum per academic year professional work period

***440 PC Based Instrumentation and Control** (3-2) Cr 4 F S *Prereq 280* Introduction to Intel microprocessors Microprocessor registers memory and programmable input/output devices Interrupts Interface standards

465 VLSI Basic Layout and Design (E E 465) (3 2) Cr 4 F *Prereq 280 credit or enrollment in E E 436* Introduction to CMOS VLSI layout and circuit design methodologies for custom integrated circuits including layout design rules and using logic timing and analog circuit simulators Delay loading fan-out power and scaling calculations and different VLSI design styles VLSI chip hardware design project

481 482 Digital Systems Design Laboratory I II (1 3) Cr 2 each F S *Prereq 481 389 E E 436 concurrent enrollment in Engl 314 482 481* Projects in digital system design Engineering applications of business and technical communication Oral and written reports required Materials fee

484 Computer Organization and Design II (Com S 484) (2 3) Cr 3 S *Prereq 384* Implementation of key aspects of a computer architecture Virtual and segmented memory architectures interrupt programmed and DMA I/O implementation of message passing shared memory and semaphores in a multitasking environment design of systems using bit-slice and PLA technology Emphasis on laboratory experiments using several departmental facilities

485 Digital System Design (E E 485) (3-0) Cr 3 S *Prereq 384 310 or Stat 333 E E 212* Design of integrated digital hardware and software system Basic elements of information theory applied to digital system design Principles of error detection/correction and fault tolerance Reliability and quality analysis Transmission line effects in digital systems Life-cycle cost analysis including maintenance and documentation costs

487 PC Based Interfacing (E E 487) (3 2) Cr 4 S *Prereq 389* Logical operation of Intel based personal computers DOS interrupts and function calls BIOS services and device interfacing

489 Computer Networking and Data Communications (E E 489) (3-0) Cr 3 F *Prereq 384 or E E 421* Survey of modern computer networking and data communications Contemporary concepts facilities practices implementations and issues

490 Independent Study Cr arr *Prereq Senior classification in computer engineering* Investigation of an approved topic
H Honors

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*See credit restriction in undergraduate study section

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

566 Design of VLSI Systems (3-0) Cr 3 S *Prereq E E 436* An intermediate VLSI course in high level digital system design VLSI design methodologies algorithmic aspects of VLSI CAD tools partitioning placement routing and simulation algorithms high level tools logic synthesizers PLA generators data path compilers and silicon compilers VLSI chip hardware project or CAD software project

580 Advanced Computer Networking and Data Communications (3 0) Cr 3 S *Prereq 489* Design implementation and analysis of computer networks and data communications systems Detailed examination of modern communication standards protocol systems and their performance Transmission technology packet switching routing flow control performance and cost

581 Distributed Computer Systems (3 3) Cr 4 S *Prereq 580* Issues in the design and implementation of distributed computer systems

including systems management tasking services transactions RPCs naming and addressing schemes and the user interface Individual or class projects

582 Computer Systems Performance (3 0) Cr 3 Alt S offered 1994 *Prereq 310 384* Introduction to measurement simulation queuing and probability theory techniques applied to quantify the performance and reliability of computer systems and networks

583 Advanced Switching Theory (3-0) Cr 3 Alt F offered 1994 *Prereq 384* Advanced topics in switching theory minimization of switching functions reliable design and fault diagnosis state identification and fault detection experiments for sequential machines finite automata

584 Advanced Digal Systems Design (3 0) Cr 3 F *Prereq 384 or Com S 524* Digital system design issues Error-correcting codes hierarchical and cache memory systems memory technologies buses standards design examples Performance and reliability analysis through queuing and probability theory

585 Advanced Computer Architecture (3-0) Cr 3 S *Prereq 485 or 584 or Com S 524* High speed computer architecture interconnection networks memory systems and VLSI design issues System-level issues like coherency and consistency of shared data and synchronization of shared resources Case studies of contemporary parallel architectures

586 Parallel Processing (3 3) Cr 4 Alt F offered 1993 *Prereq 584 or Com S 524* Methods and problems in algorithm and program construction for parallel architectures Issues include load balancing synchronization techniques minimization of contention for shared resources

587 Local Area Networks (3 3) Cr 4 *Prereq 489* Performance protocol and implementation and application of representative local area networks including Ethernet token bus token ring FDDI BitBus FastBus

588 Embedded Computer Systems (3 3) Cr 4 Alt F offered 1994 *Prereq 389* Design implementation and testing of embedded computer systems Concurrent real time control hardware/software interfaces and error handling

590 Special Topics 1 to 6 each time elected Formulation and solution of theoretical or practical problems in computer engineering

592 Seminar in Computer Engineering Cr 1 to 3 each time elected *Prereq Permission of instructor*

599 Creative Computation Cr var

Courses for Graduate Students, major or minor

685 Advanced Topics (Digital Systems (E E 685) (3-0) Cr 3 each time elected *Prereq 584* Advanced topics in computing systems taken from current literature

699 Research Cr var

Computer Science

Arthur E Oldehoeft Chair of Department

Professors Brearley Oldehoeft Slutz Thomas

Emeritus Professors Stewart

Associate Professors Baker Fernandez-Baca Gadia Grosvold Gustafson Kothari Lutz Miller Ostendorf Prabhu Strawn

Assistant Professors Soysen Chaudhuri Honavar Leavens Wong

Undergraduate Study

The curriculum in letters and sciences leading to a bachelor of science degree with a major in computer science is designed to prepare students for positions as computer scientists with business industry or government, or for graduate study in computer science This program has been accredited by the Computing Sciences Accreditation Board Inc

To complete an undergraduate degree in computer science a student must satisfy the requirements of the College of Liberal Arts and Sciences (see *Liberal Arts and Sciences Curriculum*) and include the following courses within the group requirements Phil 442 Sp Cm 212 15 credits of math and statistics including Math 165 166 or Math 175 176 plus one math course with a Math 165 or 175 prerequisite and one statistics course with a Math 165 or 175 prerequisite or Stat 401 (section for physical science math engineering) a minimum of 15 credits of natural science including Phys 221 222 and at least two additional natural science courses one of the following Engl 204 302 305 309 or 314 The minimum grade accepted in each of the required English courses including Engl 104 and 105 is a C-

A minimum of 44 credits is required for a major in computer science including Com S 101 227 228 (or 207 208) 301 311 321 330 331 342 352 361 and Cpr E 280 and 384 The remaining minimum of 9 credits must be chosen from Com S 401 411, 440 454 461 471 472 481 Cpr E 460 484 489 At least one of 411 440 454 must be chosen The following courses may not be included in the 44 credits for a computer science major 103 201 202 205 290 398 403 490 495 Students must earn a C- or better in each course listed in their major which is a prerequisite to a computer science course listed on the student s degree program

To earn a minor in computer science a student must complete Math 165 and 15 credits in Com S at the 200 level or above including 207 208 or 227 228 and at least 6 credits at the 300 level or above

Computer science majors may obtain a secondary school teaching license by pursuing a cooperative program with mathematics leading to licensure as a teacher of mathematics

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with a major in computer science The department also offers minor work to students majoring in other departments

Facilities exist for research in such areas as programming languages computer architecture operating systems database systems software engineering analysis of algorithms artificial intelligence formal languages and automata theory complexity theory and computer networks

A student desiring to do graduate work with a major in computer science should ideally have completed a bachelor s degree or equivalent in computer science Students with a major in a related area such as electrical engineering or mathematics are also encouraged to apply

For the degree master of science 31 semester credits are required Both thesis and non-thesis options are available If no thesis is presented the preparation of a paper demonstrating ability to organize and express significant ideas in computer science is required

For the degree doctor of philosophy a student is expected to demonstrate a high degree of proficiency in reading writing and speaking skills To insure such skills the student must include in the program of study a demonstrated proficiency in either a foreign language or in research skills

The Department of Computer Science participates in the interdepartmental minor in technology and social change Students majoring in computer science may elect a minor in technology and social change

The Department of Computer Science recommends that all graduate students majoring in computer science teach as part of their training for an advanced degree

Courses open to graduate students for minor credit 311 321 330 331 342 352 361 401 403 411 440 454 461 472

Courses Primarily for Undergraduate Students

101 Orientation (1-0) Cr R F S Group advising for computer science majors Review of college and university requirements transfer credits academic planning university policies and deadlines preregistration Satisfactory fail only

103 Computer Applications (2-2) Cr 4 F S Introduction to microcomputer literacy and applications Applications word processing spreadsheets database management Literacy the history of computing algorithm development structure of computers telecommunications computer ethics and computer crime No prior computer experience necessary

107 Applied Computer Programming (3-0) Cr 3 F S *Prereq Math 104 or 140 or 150* Introduction to computer programming for non majors using a PASCAL like language Basics of good programming computer systems files use of an editor and a command language

***201 Computer Programming in COBOL** (3-0) Cr 3 S *Prereq 107 or 207 or 227* Computer programming using the COBOL language Emphasis on the design writing debugging and testing of business applications programs in a transaction oriented environment

***202 COBOL Individualized Instruction** (1 6) Cr 3 F *Prereq 6 credits in computer programming* Individualized self paced study using an interactive computer based instruction system Computer programming in COBOL Writing debugging testing business applications programs Intended for self motivated students

205 Computer Programming in FORTRAN (Math 205) (3 0) Cr 3 S *Prereq Credit or enrollment in Math 166 or 176* Introduction to computer programming using the FORTRAN language Emphasis on design debugging and testing of numerical algorithms Engineering and physical science applications stressed For students in engineering and physical science

207 C Programming I (3 1) Cr 3 F S *Prereq 2 years high school algebra and 1 year high school geometry* An introduction to computer programming using the C programming language Emphasis on basics of good C programming techniques and style through extensive practice in writing running and debugging programs This course is designed for nonmajors those contemplating a major in computer science should take 227

***208 C Programming II** (3-1) Cr 3 F S *Prereq 207 credit or enrollment in Math 165* An introduction to data structures and algorithm analysis using C or C++ languages Recursion List and file processing Dynamic data structures Emphasis on writing and running programs This course is designed for nonmajors

215 Numerical Methods and FORTRAN Programming (Math 215 Aer E 215) (2-2) Cr 3 F S *Prereq Math 166 or 176 Engr 160 or Com S 207 or 227* Computer solutions to numerical engineering problems using advanced features of FORTRAN language Roots of single nonlinear equations simultaneous linear equations least square curve fitting numerical integration numerical solutions of ordinary differential equations Development of algorithms program efficiency use of debuggers

218 UNIX and C Programming (3-0) Cr 3 *Prereq 207 or 227 or equivalent programming experience* Introduction to the C programming language and the UNIX operating system and their effective use for problem solving Topics in UNIX include the establishment of user environments creation and management of files and directories common UNIX commands programming in UNIX shell language and electronic mail Topics in C include basic programming constructs use of standard program libraries multiple and parallel process control and interprocess communication

227 Introduction to Computer Programming (3 1) Cr 3 F S *Prereq 2 years high school algebra and 1 year high school geometry* An introduction to computer programming Symbolic and numerical computation Recursion and iteration Modularity and data abstraction Functional and interactive programming Imperative programming Emphasis on principles of programming and program design through extensive practice in writing running and reasoning about programs This course is designed for majors

***228 Introduction to Data Structures** (3 1) Cr 4 F S *Prereq 227 credit or enrollment in Math 165* An object-oriented approach to data structures and algorithms using C++ language Object-oriented programming Program correctness Stacks queues trees searching sorting analysis of algorithms graphs and file processing Emphasis on writing and running programs This course is designed for majors

290 Independent Study Cr arr F S *Prereq Permission of instructor* Satisfactory/fail only H Honors

301 Careers in Computer Science (1-0) Cr R S Computer science as a profession Introduction to career fields open to computer science majors Relationship of coursework to careers Presentations by computer science professionals Satisfactory fail only

311 Data Structures and Algorithm Analysis (3-1) Cr 3 F S *Prereq 208 or 228 330 or Cpr E 310* Basic techniques for design and analysis of efficient algorithms that act on data structures Set manipulation sorting graph processing and memory management algorithms

321 Introduction to Computer Architecture and Machine Level Programming (Cpr E 321) (3 2) Cr 4 F S *Prereq 107 or 207 or 227 and credit or enrollment in Cpr E 280* Introduction to computer architecture with emphasis on instruction sets and addressing modes Machine-level programming including assembly language Techniques for improving program performance Input/output and interrupts Laboratory based introduction to modern development tools and performance measurement systems

330 Discrete Computational Structures (3 1) Cr 3 F S *Prereq 207 or 227 and Math 165* Concepts in discrete mathematics as applied to computer science Logic set theory relations graphs combinatorics and their computational aspects

331 Theory of Computing (Ling 331) (3-1) Cr 3 F S *Prereq 330 or Cpr E 310* Models of computation finite state automata pushdown automata and Turing machines Study of grammars and their relation to automata Limits of digital computation unsolvability and Church-Turing thesis Chomsky hierarchy and relations between classes of languages

342 Principles of Programming Languages (3 1) Cr 3 F S *Prereq 321 331 361* Organization of programming languages emphasizing language design concepts and run time implementation Study of major features of various programming languages

352 Introduction to Operating Systems (3 1) Cr 3 F S *Prereq 361 384* Survey of operating system issues Introduction to hardware and software components including processors peripherals interrupts process and memory management deadlocks file systems protection virtual machines and system organization

361 File Organization and Processing (3 1) Cr 4 F S *Prereq 208 or 228* Concepts and techniques of structuring and processing data on external storage devices Hardware and its parameters Basic file organization including sequential indexed indexed sequential and hash files Hybrid file organization

384 Computer Organization and Design I (Cpr E 384) See *Computer Engineering*

398 Cooperative Education Cr R Required of all cooperative students *Prereq Permission of department chair* Students must register for this course prior to commencing each work period

401 Computer Based Information Systems (2 2) Cr 3 F *Prereq 361 and an additional 9 credits in Com S at the 200 level or above* Systems concepts and implementations for supporting production oriented information systems data and terminal access methods operating systems implementations data base management systems implementations data dictionary considerations data communication considerations lab experiments and implementations

403 Computer Based Instructional Systems (2-0) Cr 2 F *Prereq 208 or 228* Principles techniques languages and support systems for development and delivery of instructional software used in education and industry Programming project emphasizing computer scientist s role on a development team

411 Software Engineering (3-1) Cr 3 F S *Prereq 311 or 384* Principles and techniques for methodical construction of quality software Software requirements specification programming paradigms module specification techniques testing and validation procedures proof of program correctness Emphasis on team projects

440 Principles of Compiling (3-1) Cr 3 S *Prereq 342* Techniques of parsing Lexical analysis modern top down and bottom up parsing techniques syntax directed translation and code generation

****454 (554 DL) Implementation of Operating Systems** (3 1) Cr 3 F *Prereq 352* Laboratory course emphasizing the practical issues of operating system design and implementation through the examination of a fully functional operating system including device drivers interrupt and signal handlers file systems memory and process management Graduate credit requires additional in-depth study of design and implementation issues for advanced operating systems and networking operating systems

461 Introduction to Database Systems (3 1) Cr 3 S *Prereq 311 352* Introduction to database concepts data models (relational hierarchical and network models) data manipulation languages data description languages system implementation issues security and data integrity

471 Computational Linear Algebra and Fixed Point Iteration (Math 471) See *Mathematics*

****472 (572 DL) Principles of Artificial Intelligence** (3-0) Cr 3 F *Prereq Junior classification 208 or 228 330 or Cpr E 310* Overview of foundations scope and problems Artificial intelligence programming techniques in LISP and CLOS Search and problem solving Knowledge representation Automated inference Design and applications of knowledge-based expert systems for planning machine perception diagnosis analysis and synthesis (design) problems Introduction to machine learning and neural computation

481 Numerical Solution of Differential Equations and Interpolation (Math 481) See *Mathematics*

484 Computer Organization aid Design II (Cpr E 484) See *Computer Engineering*

490 Independent Study Cr ar, F S *Prereq 6 credits in computer science permission of instructor No more than 9 credits of Cm S 490 may be counted toward graduation* Satifactory fail only H Honors

495 Seminar Cr arr F S *Prerq Permission of instructor* Satisfactory fail only

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*Credit for only one course in ch of the following pairs of courses may be applie toward graduation 201 and 202 208 and 228

**See page 119 for information dual listed (DL) courses

Courses Primarily for raduate Students, major or mir, open to qualified undergradua

507 Numerical Solution of Cinary Differential Equations (Math 507) See *Mematics*

509 Computational Methodf Linear Algebra (Math 509) See *Mathematics*

511 Design and Analysis ofjorithms (3 0) Cr 3 F *Prereq 311 330* Des analysis and complexity of algorithms Geni techniques for solving problems (divide and quer backtracking etc) Sorting algorithms grapgorithms algebraic algorithms fast Fourier transh and NP completeness

512 Software Engineering I) Cr 3 F *Prereq 311 330* A survey of formal cs relevant to the software life-cycle process irling requirements specifications design implelation testing and maintenance Implications ofnal results for software prototyping and autted testing

524 Computer System Arc ture (3-0) Cr 3 F *Prereq 352 384* Fundamenof computer design performance and costruction set design basic processor implntation techniques pipelining memory design os I/O systems multiprocessor systems intnection networks

531 532 Theoretical Founins (3 0) Cr 3 ea 531 F 532 S *Prereq 531 532 531* Analytical methods and techs used in the study of computer science : automata and regular sets context free grars pushdown automata Chomsky hierarcicidable and undecidable problems basirsive function theory computational comp and intractable problems

541 Programming Langul (3-1) Cr 3 S *Prereq 342 or 440* Survey goals and problems of language desicmal and informal studies of a wide array of pnming language features including type sys naming state and control Creative use of funl object-oriented declarative concurrent and programming paradigms

542 Programming Langul (3-0) Cr 3 F *Prereq 440* Compilation tind techniques emphasis on high level softools to facilitate compiler construction Lexalysis parsing attribute grammars code tion and optimization for traditionalintraditional languages and architectur

552 Principles of Operatstems (3-0) Cr 3 S *Prereq 352* A comparudy of high level language facilities for pronchronization and communication Formal aof deadlock memory management pond system performance Protection ncluding capability based systems access a control encryption and inference control

**554 (454 DL) Implementation of Operating Systems (3 1) Cr 3 F *Prereq 352* Laboratory course emphasizing the practical issues of operating system design and implementation through the examination of a fully functional operating system including device drivers interrupt and signal handlers file systems memory and process management Graduate credit requires additional in depth study of design and implementation issues for advanced operating systems and networking operating systems

561 Principles of Database Systems (3 0) Cr 3 S *Prereq 311 and 352* Introduction to database system concepts Physical data organization The network model and the DBTG proposal The hierarchical model The relational model Relational query languages Functional dependencies Multivalued dependencies Decomposition of relation schemes Normal forms Query systems Query optimization Concurrence control Distributed database systems

**572 (472 DL) Principles of Artificial Intelligence (3 0) Cr 3 F *Prereq 208 or 228 330 or Cpr E 310* Overview of foundations scope and problems Artificial intelligence programming techniques in LISP and CLOS Search and problem-solving Knowledge representation Automated inference Design and applications of knowledge-based expert systems for planning machine perception diagnosis analysis synthesis (design) problems Introduction to machine learning and neural computation Graduate credit requires a research project in artificial intelligence algorithms and a written report

573 Computational Models of Learning (3 0) Cr 3 S *Prereq 572 and mathematical maturity expected of beginning graduate students in the sciences* Biological psychological and computational models of learning Parametric and nonparametric statistical methods Similarity difference based algorithms representational and inductive biases Neural network models Evolutionary search and genetic algorithms Computational learning theory Deductive learning Computational models of scientific mathematical and conceptual discovery

586 Computer Network Architectures (3-0) Cr 3 F *Prereq 511 524 or Cpr E 489* Design and development of advanced computer communication networks distributed and failsafe routing in large and dynamic networks gateways and interconnection of heterogeneous networks flow control and congestion avoidance techniques network architectures computer and communication security communication protocol standards formal specification and verification of protocols implementation and conformance testing of protocol standards network partitioning and intelligent reconfiguration of networks

590 *Special Topics Cr arr Prereq Permission of instructor* Satisfactory fail only

591 Faculty Research Interests (1 0) Cr 1 S *Prereq Graduate classification* Discussion of research interests and projects by members of the graduate faculty Students select and prepare a written report on some topic of interest This class is mandatory for the M S degree and is taken during the second semester of a normal M S program Satisfactory fail only

599 Creative Component Cr arr Satisfactory/fail only

**See page 119 for information on dual listed courses

Courses for Graduate Students, major or minor

610 Seminar Cr arr Satisfactory fail only

611 *Advanced Topics in Analysis of Algorithms* (3 0) Cr 3 Alt S offered 1995 *Prereq 511 531* Advanced algorithm analysis and design techniques Graph algorithms algebraic algorithms NP completeness probabilistic and parallel algorithms intractable problems

624 Advanced Topics in Computer Architecture (3-0) Cr 3 Alt S offered 1994 *Prereq 524* Shared memory multiprocessors distributed memory machines systolic processing neural networks issues in high performance computing comparative study of different architectures performance models

625 Issues in Parallel Programming and Performance (3 0) Cr 3 Alt S offered 1995 *Prereq 511 524* Parallel solutions of numerical and non numerical problems implementation of parallel programs on parallel machines performance and other computational issues in parallel programming

631 Computational Complexity (3-0) Cr 3 Alt F offered 1993 *Prereq 531* Advanced study in the quantitative theory of computation Time and space complexity of algorithmic problems The structure of P NP PH PSPACE *and other complexity classes* especially with respect to resource bounded reducibilities and complete problems Complexity relative to auxiliary information including oracle computations and relativized classes randomized algorithms advice machines and Boolean circuits Kolmogorov complexity and randomness Parallel complexity including uniform circuits branching programs alternating Turing machines and parallel RAM s

641 Semantic Models for Programming Languages (3-0) Cr 3 Alt F offered 1994 *Prereq 531 541* Interpretive denotational and logically based models of semantics application of semantics to program correctness language specification and translation

652 Topics in Distributed Operating Systems (3 0) Cr 3 Alt F offered 1993 *Prereq 552* Concepts and techniques for network operating systems high level languages and communication protocols name and object management concurrency control for consistent distributed data design of reliable software protection performance analysis

661 Advanced Topics in Database Systems (3 0) Cr 3 Alt F offered 1994 *Prereq 561* Advanced topics chosen from the following list Data dependencies Data models Query systems Query optimization Null values partial information and database semantics Acyclic database schemes Concurrency control mechanisms Distributed database systems Logic and databases

699 Research Satisfactory fail only

Construction Engineering

(Administered by the Department of Civil and Construction Engineering)

James E Rowings Jr Professor in Charge

Emeritus Professors Jellinger

Associate Professors Chase Ringwald Rowings

Emeritus Associate Professors Ward

Assistant Professors Federle Jaselskis

Undergraduate Study

For undergraduate curriculum in construction engineering leading to the degree bachelor of science see *College of Engineering Curricula*

Construction engineering is a curriculum administered by the Department of Civil and Construction Engineering and is designed to prepare students for work as constructors Construction requires persons with a strong fundamental knowledge of engineering and management principles and a knowledge of business procedures economics and human behavior Graduates of this curriculum may expect to engage in design of temporary structures cost estimating, planning and scheduling management materials procurement equipment selection and cost control The curriculum blends engineering management and business sciences into a study of the processes of construction whereby designers plans and specifications are converted into physical structures and facilities These processes involve the organization administration and coordination of all the elements involved in construction—labor temporary and permanent materials equipment, supplies and utilities money technology and methods and time—to complete construction projects on schedule within the budget and according to the standards of quality and performance specified by the designer The master of this discipline with knowledge acquired through education and experience is a constructor The curriculum offers a choice of study emphases concerned with building heavy or mechanical construction

Interested qualified students have the opportunity to participate in a cooperative education program to supplement academic work with work experience in the construction industry See *Cooperative Education Programs College of Engineering*

Graduate Study

An area of specialization in construction engineering is offered within the graduate program of the Department of Civil and Construction Engineering See *Civil Engineering, Courses and Programs* Courses are offered for minor work to students taking major work in other curricula or in interdepartmental programs

Open to graduate students for minor graduate credit only 322 340 421 441

Courses Primarily for Undergraduate Students

110 Introduction to Construction Engineering (4-0) Cr R S 2 weeks The nature and scope of the construction industry Overview of the profession and education for the constructor Meets for two Saturdays Materials fee

221 Contractor Organization and Management of Construction (4-0) Cr 4 F S *Prereq Completion of basic program* Entry level course for construction engineering integration of significant statistical engineering economics and management issues related to efficient construction company operations Probability and statistics time value of money methods of evaluating alternative projects organization operations construction company administration marketing insurance and bonding project safety labor law productivity total quality management and motivation and leadership Materials fee

241 Construction Materials and Methods (2-3) Cr 3 F S SS *Prereq 221* Introduction to materials and methods of building construction and to construction drawings Foundation structural framing floor roof and wall systems Mechanical and electrical installations Blueprint reading and quantity takeoff techniques Field trip Materials fee

245 Construction Contract Documents (3-0) Cr 3 F S SS *Prereq 221 or Arch 240* Definition interpretation and utilization of drawings specifications agreements bidding forms general conditions bonds subcontracts and related documents Materials fee

298, 398, 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of

all cooperative education students Students must register for these courses prior to commencing each work period

322 Construction Equipment and Heavy Construction Methods (2 3) Cr 3 F S *Prereq 241 245 credit or enrollment in C E 360* Selection and acquisition of construction equipment Application of engineering fundamentals and economics to performance characteristics and production of equipment Heavy construction methods and economic applications Field trip Materials fee

340 Concrete and Steel Construction (2 3) Cr 3 F S *Prereq Credit or enrollment in 322 E M 324* Planning and field engineering for concrete and steel construction Design and applications of concrete formwork to construction Erection of structural steel Field trip Materials fee

397 Engineering Internship Cr R F S *Prereq Permission of department* Professional work period one semester maximum per academic year

410 Professional Development (1-0) Cr 1 F S *Prereq Senior classification in construction engineering* Employment opportunities résumé preparation job search and interviewing Professional registration and ethics current industry issues professional and industry associations Materials fee

421 Construction Estimating (2-3) Cr 3 F S *Prereq 340* Conceptual estimating Bid preparation for buildings highways heavy mechanical trades Estimating costs for material labor equipment overhead and profit Quantity surveys unit costs production rates and pricing methods Subcontract bid analysis and bid procedure Cost analysis and cost control Materials fee

441 Construction Planning Scheduling and Control (2-3) Cr 3 F S *Prereq 421* Integration of previous construction coursework into the planning scheduling and management of time costs and other resources Emphasis on preparation and analysis of network schedules Computer applications Materials fee

490 Independent Study Cr 1 to 5 each time taken F S SS *Prereq Permission of professor in charge* Individual study in any phase of construction engineering Pre-enrollment contract required

Criminal Justice Studies

(Interdepartmental Undergraduate Program)

Martin G Miller Program Coordinator

The criminal justice studies minor a cross-disciplinary course of study in the College of Liberal Arts and Sciences offers an opportunity for students to learn about the components of the criminal and juvenile justice systems to become acquainted with the issues and problems affecting these systems to apply theoretical concepts to real world problems and to plan a career in criminal or juvenile justice

Students who declare a minor in criminal justice studies are required to complete an orientation course and a professional seminar a core curriculum a practicum, and electives based on specific career interests In consultation with the program coordinator students select six credits of electives based on career interests such as law enforcement probation and parole correctional counseling justice agency administration and justice planning and research Students should contact the program coordinator for information and program planning

Primary Courses

201 Orientation to the Criminal and Juvenile Justice Systems Cr R F *Prereq Freshman or sophomore classification* Various components of the criminal and juvenile systems Opportunities challenges and preparation of a criminal justice professional Guest speakers and field trips Offered on a satisfactory fail basis only

241 Youth and Crime (Soc 241) Cr 3

320 American Judicial Process (Pol S 320) Cr 3

332 Philosophy of Law (Phil 332) Cr 3

340 Deviant and Criminal Behavior (Soc 340) Cr 3

401 Professional Seminar in Criminal and Juvenile Justice Cr R S *Prereq Senior classification* Critical analysis of professional ethical and public issues affecting criminal and juvenile justice systems Survey of current professional opportunities and preparation for the job search process Offered on a satisfactory fail basis only

460 Criminal and Juvenile Justice Practicum (Soc 460) Cr 3

Curriculum and Instruction

Ann D Thompson Chair of Department

Professors Abelson Andre Baum Brown Carter Daly Dilts Downs Duffelmeyer Glass Henney Kahler Keller Knaphus Messenger Miller Rasmussen Rudolph Simonson Sternberg Tanner Thompson Volker D Williams S Williams Zbaracki

Emeritus Professors Barnhart Bath Beard Breiter Burkhalter Charles Coulson Hoerner Hughes Hunter Peterson Schloerke Schneider

Associate Professors Allen Amos Christensen Deluca Kelly Kiyoguchi Martin McCormick Merkley Newman Owen Payne Phye Schilling Smith Stuart Torrie Wood

Emeritus Associate Professor Ebert

Assistant Professors Allen-Sommerville Bligh Carlson Chatfield Graf Hausafus McMurray-Schwarz Rieck Sharp-Laird Shaw Strong Whigham

Instructors Connor Killmer Tartakov

Undergraduate Study

The Department of Curriculum and Instruction provides the professional education coursework that leads to licensure of pre-service teachers Students major in elementary education for K-6 teaching license Students seeking a birth through third grade license major in early childhood education Students may double major in elementary education and early childhood education in the College of Education Secondary licensure students major in their respective content areas Early childhood education elementary and secondary majors must complete a professional course sequence Psych 333 ElEd/SecEd 204 301 and 406

Early Childhood Education

The curriculum in early childhood education prepares teachers for children from birth through age 8 (approximately third grade) It is jointly administered by the Department of Curriculum and Instruction in the College of Education and the Department of Human Development and Family Studies in the College of Family and Consumer Sciences

Elementary Education

For the undergraduate curriculum in elementary education leading to the degree bachelor of science see *Education Curriculum*

The curriculum in elementary education is planned for persons who want to teach at the elementary school level The section offers licensures in reading and in mental disabilities for elementary education students An endorsement for teaching foreign language in elementary schools is available through the Department of Foreign Languages and Literatures A minor in mental disabilities is available for students in other curricula Students who enroll in elementary education must make application to and be accepted by the departmental teacher education committee and the University Committee on Teacher Education prior to classifying in advanced elementary education courses For admission and licensure requirements see *College of Education*

Secondary Education

Students seeking recommendations for a license to teach in the secondary schools must be admitted to the teacher education program and pursue a program that includes the following Psych 333 SecEd 400 426, special methods and student teaching in the area of specialization

All students who are recommended by Iowa State University for teacher licensure must meet the requirements of the teacher education program and be recommended by the College of Education Each student will be enrolled in the department in which he or she plans to major and must meet the graduation requirements of that department and the college in which it is located For specific requirements for each area of specialization see *Teacher Education* and curricula for the college in which the chosen degree major is sought

The section offers a minor in educational computing that may be earned by completing the following courses Com S 103 or SecEd 101 Com S 107 Psych 316 and SecEd 280B 301 302 and 403 A teaching licensure in mental disabilities is also offered

Graduate Study

The departments of Curriculum and Instruction and Professional Studies in Education offer work for the degrees master of science master of education and doctor of philosophy with a major in education and minor work to students taking major work in other departments Within the education major in the Department of Curriculum and Instruction a student must specialize in elementary education (master s only) special education (master s only) or curriculum and instructional technology See *Professional Studies in Education* for further discussion of the education major with specialization in adult and extension education counselor education educational administration higher education historical philosophical and comparative studies in education and research and evaluation

Students may choose an area of specialization for study The specialization in curriculum and instructional technology is

designed to prepare candidates as researchers and practitioners in the fields of curriculum and instructional technology Graduate licensure programs in learning disabilities behavioral disorders multicategorical education and K-12 school media specialist are administered through the Department of Curriculum and Instruction

Prerequisite to major graduate work in education is preparation substantially equivalent to the completion of one of the undergraduate curricula in education offered at Iowa State University or graduate preparation in a discipline to be used as a teaching field in a community college or university and adequate proof that the student ranks above average in scholastic ability and promise of professional competence

The foreign language requirement if any for the Ph D degree will be determined by the student s program of study committee If no foreign language is required the total program must consist of a minimum of 78 semester credits at least 12 of which must be earned outside the education major and at least 16 of which must be earned outside the area of specialization Statistics and research methods may not be included in the 16 credits Should foreign language be included the program of study committee may adjust the minimum program requirement downward but in no instance may the program of study be less than 72 semester credits Students whose native language is not English may substitute competence in English All applicants for the Ph D must submit Graduate Record Examination (GRE) scores

Other graduate programs related to education (including General Graduate Studies) may be planned for students on the basis of previous education and experiences as well as future plans and needs Students should refer to *Agricultural Education and Studies Family and Consumer Sciences Education Health and Human Performance Industrial Education and Technology Professional Studies in Education* and *General Graduate Studies* or to graduate level course offerings within other departments

Open to graduate students for minor credit only Sp Ed 457

Elementary Education (El Ed)

Courses Primarily for Undergraduate Students

101 Educational Applications of Computers (SecEd 101) (2-2) Cr 3 F S SS Introduction to the general nature of computers and their applications in educational and instructional settings Use of prepared software packages for microcomputers and minicomputers

115 Freshman Orientation Cr R F S Overview of elementary education curricular opportunities transitions to college and community life and university procedures Required of all freshmen majoring in elementary education Offered on a satisfactory fail basis only

204 Social Foundations of American Education (SecEd 204) See *Secondary Education*

215 Sophomore Orientation Cr R F S Review of elementary education requirements Program planning Required of all sophomores majoring in elementary education Offered on a satisfactory fail basis only

245 Strategies in Teaching (2 0) Cr 2 F S SS *Prereq 204 concurrent enrollment in 268 eligibility for admission to teacher education program* Introduction to elementary education teaching strategies Open to students in the elementary education curriculum or the early childhood education curriculum only

250 Education of the Exceptional Learner (Sp Ed 250) See *Special Education*

268 Strategies Practicum (0 2) Cr 1 F S SS *Prereq 204* Clinical experience to be taken concurrently with 245 Offered on a satisfactory fail basis only

280 Pre Student Teaching Experience (SecEd 280) See *Secondary Education*

281 The Special Needs Student Experience (Sec Ed 281) See *Secondary Education*

282 The Urban Student Experience (Sec Ed 282) See *Secondary Education*

290 Independent Study Cr 1 to 3 *Prereq 6 credits in elementary education permission of department head*

301 Instructional Media (SecEd 301) (1 1) Cr 1 F S SS *Prereq 204* Design production presentation and evaluation of educational media for teaching in specific subject areas Analysis of commercially and locally produced software including multicultural and human relations materials Planning developing objectives and techniques of teaching with media Fee for materials

315 Transfer Orientation Cr R F S Overview of elementary education requirements curricular opportunities and university procedures Program planning Required of all transfer students majoring in elementary education Offered on a satisfactory fail basis only

375 The Teaching of Reading (3-0) Cr 3 F S SS *Prereq 245 250 268 HD FS 240 admission to teacher education program concurrent enrollment in 468A and 376* Approaches methods and materials for teaching developmental reading in the elementary school

376 The Teaching of Language Arts (3 0) Cr 3 F S SS *Prereq 245 250 268 admission to teacher education program concurrent enrollment in 468B and 375* Methods materials and development of teaching skills in language arts

406 Multicultural Awareness and Non Sexism in the Classroom (SecEd 406) See *Secondary Education*

417A 417B Supervised Student Teaching F S *Prereq GPA 2 5 full admission to teacher education senior classification 301 375 376 443 448 449 Sp Cm 212 reservation required* Supervised teaching experience
A Primary grades Cr 8
B Intermediate grades Cr 8
C Foreign Languages Cr 3

422 Reading and Language Arts Instruction with Microcomputers (2-2) Cr 3 *Prereq 375 SecEd 101 or 302 Keyboarding ability highly recommended* Teaching reading and writing with microcomputers Evaluation and use of reading and language arts software Use of word processing for language and reading instruction

443 The Teaching of Social Studies (3 0) Cr 3 F S SS *Prereq 375 junior classification* Methods materials and development of teaching skills in social studies Peer and limited elementary classroom experience

447 Teaching in the Kindergarten (3 0) Cr 3 F S SS *Prereq Psych 230 or HD FS 102 or HD FS 129* Application of developmental processes to learning contemporary trends and issues in programming and curriculum planning and screening procedures

448 The Teaching of Mathematics (3-0) Cr 3 F S SS *Prereq 375 concurrent enrollment in 449 and 468C junior classification 3 credits in mathematics* Procedures for teaching mathematics to children Emphasis on developmental implications teaching methods and current programs

449 The Teaching of Science (3 0) Cr 3 F S SS *Prereq 375 concurrent enrollment in 448 and 468D junior classification* Procedures for teaching science to children Emphasis on developmental implications teaching processes teaching methods discovery inquiry approach and current programs

450 Ethnicity and Learning (3-0) Cr 3 *Prereq 245* Examination of cultural relevance in education

451 Ethnicity and Learning Practicum (1-4) Cr 3 *Prereq 450* Field experience in a multi ethnic or ESL (English as a Second Language) classroom setting Students must have one full day open each week in order to participate

457 Teaching Exceptional Learners in the Regular Classroom (Sp Ed 457) See *Special Education*

468 Supervised Practicum in Teaching Cr 0 5 to 1 F S SS *Prereq 245 250 268 admission to teacher education program* Observation and instructional experiences with children in a supervised elementary classroom while engaged in other elementary methods courses Fee for field trip Offered on a satisfactory fail basis only
A Reading Cr 1
B Language Arts Cr 1
C Mathematics Cr 0 5
D Science Cr 0 5
E Foreign Language Cr 1

478 Diagnosis and Correction of Reading Problems (3-0) Cr 3 *Prereq 375* Diagnosis of reading problems using informal as well as dynamic assessment Programs and strategies to remediate both corrective and remedial readers

486 Methods in Elementary School Foreign Language Instruction (F Lng 486) See *Foreign Languages and Literatures*

***488 (588 DL) Meeting Individual Needs in Reading Instruction** (3 0) Cr 3 *Prereq 375 478* Planning and implementing procedures for meeting the reading needs of individual learners Field experience

***489 (589 DL) Reading and Writing Across the Curriculum** (3 0) Cr 3 *Prereq 375* Analysis of models and instructional strategies appropriate for developing children s reading and writing skills in content areas

490 Independent Study Cr 1 to 5 *Prereq At least 12 credits in elementary education permission of department head*
H Honors

495 Seminar Cr 1 to 3 F S SS A variety of topics concerned with elementary education Topics vary each semester depending on issues explored May be repeated Offered on a satisfactory/fail basis only

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

520 Teaching Strategies for Individualized Instruction (2 0) Cr 2 S SS *Prereq 9 credits in behavioral sciences* Analysis of current trends and practices for individualizing instruction

521 Surveying Gifted Education (3-0) Cr 3 *Prereq 9 credits in education* Survey of major areas of concern in the field of education for the gifted Includes definitions program objectives program types teaching strategies and tools

522 Corrective Reading (3 0) Cr 3 F SS *Prereq 375* Identification analysis and correction of reading problems within the elementary program in five skill areas print knowledge integration of print knowledge oral reading fluency vocabulary and comprehension

523 Corrective Mathematics (3-0) Cr 3 S SS *Prereq 448* Identification analysis and correction of mathematics problems within the elementary program in the 13 curriculum standards presented by the National Council of Teachers of Mathematics

531 Research in Gifted Education (2 0) Cr 2 *Prereq 9 credits in education including one course in gifted education* Emphasis on research in teaching strategies program development and other areas of topical concern Informal assessment instruments relating to educational programs

532 Methods Models and Materials for Teaching Gifted Children (3 0) Cr 3 *Prereq 9 credits in education including one course in gifted education* Teaching models and the methods and materials used with TAG students

543 Teaching Science to Elementary School Students (3-0) Cr 3 *Prereq Teaching license* Critical examination of the discipline of science within the elementary school curriculum Emphasis on content assessment and revision of science programs using current curriculum procedures

550 Current Trends and Issues in Elementary Education (3-0) Cr 3 *Prereq Teaching license* Focuses on the economics social and political trends and issues affecting instruction in elementary schools

568 Reading for Mildly Handicapped Adolescents (Sp Ed 568) See *Special Education*

575 The Teaching of Reading in the Elementary School Theory and Practice (3-0) Cr 3 S SS *Prereq 375* An analysis of issues and methods pertaining to teaching reading in the elementary school

577 Teaching Writing and Reading with the Microcomputer in Elementary Schools *(2 2) Cr 3 Prereq Teaching license Application of current research and recommendations for integrating microcomputers with reading and language arts instruction Software evaluation and appropriate uses Application with students*

588 (488 DL) Meeting Individual Needs in Reading Instruction (3-0) Cr 3 *Prereq 375 478* Planning and implementing procedures for meeting the reading needs of individual learners Field experience

589 (489 DL) Reading and Writing Across the Curriculum (3 0) Cr 3 *Prereq 375* Analysis of models and instructional strategies appropriate for developing children s reading and writing skills in content areas

590 Special Topics Cr 1 to 5 *Prereq 15 credits in education permission of department head*

591 Supervised Field Experience (0-2 to 12) Cr 1 to 6 F S SS *Prereq 15 graduate credits in special area* Supervised on the job field experience in special area Fee for field trips
A Gifted and Talented
B Foreign Language
C Elementary Education

593 Workshop Cr 1 to 5 SS *Prereq 15 credits in education*

599 Creative Component Cr 1 to 5 *Prereq 15 credits in education*

Courses for Graduate Students, major or minor

615 Seminar (1 to 3-0) Cr 1 to 3 F S *Prereq 15 credits in education*

699 Research Cr arr *Prereq 15 credits in education*

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*See page 119 for information on dual listed (DL) courses

Secondary Education

Courses Primarily for Undergraduate Students

101 Educational Applications of Computers (El Ed 101) See *Elementary Education*

190 Independent Study Cr 1 to 4

204 Social Foundations of American Education (El Ed 204) (3-0) Cr 3 F S SS Goals of schooling including the roles of teachers today historical development of schools educational reforms and alternative forms and current philosophical issues Human relations aspects of teaching and discussions about teaching as a career

280 Pre Student Teaching Experience (El Ed 280) Cr 1 to 2 each time taken maximum of 8 credits F S SS El Ed 280A may be taken alone For enrollment in 280B G 280A must be either a prerequisite or taken concurrently Field experience in area educational settings 2 hour blocks of time needed for field experience Offered on a satisfactory fail basis only
A Teacher Aide
B Educational Computing
C Native American Tutoring
D Museum Education
E Disadvantaged Youth
F International Student
G Gifted and Talented Students

281 The Special Needs Student Experience (El Ed 281) (0-4) Cr 2 each time taken maximum of 6 credits F S SS Seminars and visits to public schools serving special students One week practicum at the Iowa School for the Deaf the Iowa Braille and Sight Saving School Woodward State Hospital School and State Mental Health Institutes Offered on satisfactory fail basis only

282 The Urban Student Experience (El Ed 282) (0 2) Cr 1 or 2 each time taken maximum of 4 credits F S SS Seminars and visits to urban schools and to organizations serving urban students Offered on satisfactory fail basis only

290 Independent Study Credits 1 to 3 Offered on a satisfactory fail basis only

301 Instructional Media (El Ed 301) See *Elementary Education*

302 Using Microcomputers in the Classroom (2 2) Cr 3 F S *Prereq 101 or Com S 107* Integrating microcomputer applications into the curriculum designing classroom applications for tool software selecting and evaluating software for the classroom issues and trends in computer based instruction

395 Reading for Secondary School Teachers (3-0) Cr 3 F S *Prereq Engl 219* Aspects of reading that pertain to secondary school curriculum and content area reading Identification of reading skills and deficiencies Reading comprehension evaluation techniques readability reading attitudes and interests

396 Supervised Tutoring in Secondary Reading (2-6) Cr 1 to 3 *Prereq One course in reading permission of instructor* Practical experience in evaluating and developing materials for tutorial purposes and in teaching students in a tutorial situation Consultation and meetings with instructor

403 Design and Development of Computer Assisted Instruction (2 2) Cr 3 S *Prereq 302* Application of principles of instructional development and learning theory to development of computer based instructional systems Linear and branched programming techniques and interactive videodisc systems Analysis of research related to individualizing instruction with computer systems

406 Multicultural Awareness and Nonsexism in the Classroom (El Ed 406) (2-0) Cr 2 F S SS *Prereq 204 Psych 333 junior classification admission to teacher education program* Awareness and nature of cultural pluralism need for multicultural nonsexist education educational problems cultural groups—their perceptions needs and contributions problems and issues regarding ethnocentrism prejudice discrimination racism and sexism in the school environment curriculum infusion multicultural nonsexist interaction design and execution of teaching strategies
C Taken by CUTE students only

415 Senior Seminar Cr R F S SS *Prereq Senior classification admitted to teacher education program* Overview of requirements for teacher certification in Iowa and other states functions of Education Placement Office examined interviewing procedures

417 Student Teaching (LAS 417) See *Liberal Arts and Sciences Cross Disciplinary Studies*

426 Principles of Secondary Education (3 or 4-0) Cr 3 or 4 F S SS *Prereq 301* The curriculum classroom management organization of schools career planning student evaluation legal aspects of education career education human relations support services professionalism and individualizing instruction A planned field experience is a professional growth activity included in the course Students enrolling for four credits must complete an extended field experience or seminar on a secondary education issue

480 Field Experience for Secondary Teaching Preparation (LAS 480) See *Liberal Arts and Sciences Cross Disciplinary Studies*

490 Independent Study Cr 1 to 3 *Prereq GPA of 2 5 or more for preceding semester*
A Music Education (Music 490A) See *Music*
B Vocational and Educational Guidance
C Curriculum Construction
D Principles of Education
E Methods of Teaching
H Honors
I Foundations of Educational Statistics
S Foundations of Education

492 Methods of Teaching Science (LAS 492) See *Liberal Arts and Sciences Cross Disciplinary Studies*

493A Methods of Teaching History and Social Sciences (LAS 493A) See *Liberal Arts and Sciences Cross Disciplinary Studies*

493B Preparation for Student Teaching (LAS 493B) See *Liberal Arts and Sciences Cross Disciplinary Studies*

494 English in the Secondary Schools (Engl 494) See *English*

495 Teaching Speech (Sp Cm 495) See *Speech Communication*

496 Methods of Teaching Foreign Languages (F Lng 496) See *Foreign Languages and Literatures*

497 Teaching of Secondary School Mathematics (Math 497) See *Mathematics*

Special Education (Sp Ed)

Courses Primarily for Undergraduate Students

250 Education of the Exceptional Learner (El Ed 250) (3 0) Cr 3 F S SS An overview of exceptional learners Emphasis on identification educational and vocational needs and current practices

360 Education of the Mentally Disabled (3-0) Cr 3 *Prereq 250* A study of the physical emotional social and learning behaviors of the mentally disabled as related to education and vocational programs

365 Analyzing Learning Problems (3-0) Cr 3 F S *Prereq 360* Formal and informal diagnostic instruments used by teachers to determine the academic and adaptive behavior levels of mentally disabled students

417C 417D Supervised Student Teaching Cr 8 each F S *Prereq Full admission to teacher education senior classification student in elementary or secondary education section Also for C 365 430 431 434 458 Also for D 365 431 432 433 434 458 Reservation required*
C Mentally disabled—elementary
D Mentally disabled—secondary

430 Curriculum for Mildly Mentally Disabled (3-0) Cr 3 *Prereq 360* Methods and materials employed to teach borderline and mildly mentally disabled students

431 Curriculum for Moderately Mentally Disabled (3-0) Cr 3 *Prereq 360* Methods materials and approaches commonly used in teaching functional living skills self help skills social adjustment and vocational skills to moderately disabled students

432 Programming for Mentally Disabled Secondary Students (3-0) Cr 3 *Prereq 360* Educational approaches to teaching independent living skills and vocational preparation for mentally disabled adolescents

433 Career/Vocational and Community Programs for Mentally Disabled Students (3-0) Cr 3 *Prereq 360* Study of community involvement career/vocational and sheltered

workshop opportunities for mentally disabled adolescents

434 Seminar The Mentally Disabled (2 0) Cr 2 *Prereq 360* A variety of topics concerned with education of mentally disabled students Topic will vary each semester e g parent counseling career education vocational guidance

457 Teaching Exceptional Learners in the Regular Classroom (El Ed 457) (3 0) Cr 3 F S SS *Prereq 250* Emphasis on teaching techniques teacher attitudes and instructional modifications for mainstreaming exceptional learners (learning disabilities behavioral disorders mental disabilities physically and perceptually handicapped and gifted and talented children)

458 Field Experience and Practicum with Mentally Disabled Learners (0-4) Cr 1 *Prereq Concurrent enrollment in one of the following 360 365 430 431 432* Observation and involvement with mentally disabled children One semester hour required in a resource room setting and one in a self-contained MD room Must be taken twice Offered on a satisfactory/fail basis only

490 Independent Study Cr 1 to 5 *Prereq At least 12 credits in elementary education permission of department head*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

511 Introduction to the Education of Children and Youth with Behavior Disorders (3-0) Cr 3 *Prereq Teaching license* Epidemiological studies patterns of service delivery identification procedures exemplary educational programs and concerns about management of children and adolescents

512 Educational Interventions for Behaviorally Disordered Children and Youth (2-0) Cr 2 *Prereq Teaching license concurrent enrollment in 513 or 514* Intervention approaches to meet the academic social and emotional needs of behaviorally disordered children and youth in the school setting Adapting educational materials and plans coordination of school and community

513 Educational Interventions for Behaviorally Disordered Children in the Elementary Schools (1 0) Cr 1 *Prereq Teaching license concurrent enrollment in 512* Application of the basic principles of educational intervention approaches to elementary school children who are identified as behaviorally disordered

514 Educational Interventions for Behaviorally Disordered Youth in the Secondary School (1-0) Cr 1 *Prereq Teaching license concurrent enrollment in 512* Application of the basic principles of educational intervention approaches to secondary school youth who are identified as behaviorally disordered

515 Curriculum Based Assessment of Children and Youth with Learning and Behavioral Disorders (3 0) Cr 3 *Prereq Teaching license* Individual educational diagnostic procedures and techniques

516 Seminar Research in Educational Procedures for Behaviorally Disordered Children and Youth (2 0) Cr 2 *Prereq 512 515* Critical review of recent literature in education and psycho behavioral sciences as applied to education of behaviorally disordered students

530 Introduction to Multicategorical Instruction (3 0) Cr 3 *Prereq Teaching license* Educational services examined from historical perspective current trends and issues basic theoretical and practical approaches with educational alternatives and implications of federal and state statutes

531 Methods for Teaching Multicategorical Classrooms (2 0) Cr 2 *Prereq 530 concurrent enrollment in 532 or 533* Remedial instructional models and materials for individualized instruction and behavior management for mildly handicapped students

532 Multicategorical Strategies for Elementary Teaching (1 0) Cr 1 *Prereq Concurrent enrollment in 531* Application of teaching/learning strategies appropriate at the elementary level

533 Multicategorical Strategies for Secondary Teaching (1-0) Cr 1 *Prereq Concurrent enrollment in 531* Application of teaching/learning strategies appropriate at the secondary level

540 The Child with Learning Disabilities (3-0) Cr 3 *Prereq Teaching license* Conceptualizations of characteristics of the learning disabled as well as possible etiologies of learning problems

541 Teaching Strategies for Learning Disabilities (2-0) Cr 2 *Prereq 540 concurrent enrollment in 542 or 543* Analysis of techniques and materials for remedying specific learning disabilities

542 Learning Disabilities Strategies for Elementary Teaching (1-0) Cr 1 *Prereq Concurrent enrollment in 541* Application of instructional strategies and materials modification for elementary school students

543 Learning Disabilities Strategies for Secondary Teaching (1-0) Cr 1 *Prereq Concurrent enrollment in 541* Application of instructional strategies and materials modification for secondary school students

560 Classroom Management (3-0) Cr 3 *Prereq Teaching license* Current classroom management techniques Emphasis on practical use of techniques with exceptional students in regular and special education classrooms

564 Consultation Methods in Special Education (2 0) Cr 2 *Prereq Teaching license* Techniques for collaboratively solving classroom problems by professionals with diverse expertise and responsibilities

568 Reading for Mildly Handicapped Adolescents (El Ed 568) (0 3) Cr 3 S *Prereq Teaching license* Analysis of strategies for teaching reading in conjunction with content area subjects to mildly handicapped students

590 Special Topics Cr 1 to 5 *Prereq 15 credits in education permission of department head*

591 Supervised Field Experience (0-2 to 12) Cr 1 to 6 F S SS *Prereq 15 graduate credits in special area* Supervised on the job field experience in special areas Fee for field trips

A Learning Disabilities Elementary
B Learning Disabilities Secondary
C Behavioral Disorders—Mild Elementary
D Behavioral Disorders—Mild Secondary
E Behavioral Disorders—Moderate to Severe Elementary
F Behavioral Disorders—Moderate to Severe Secondary
G Multicategorical Elementary
H Multicategorical Secondary

593 Workshop Cr 1 to 5 *Prereq 15 credits in education*

599 Creative Component Cr 1 to 5 *Prereq 15 credits in education*

Courses for Graduate Students

615 Seminar Cr 1 to 3 Prereq 15 credits in education

699 Research Cr arr Prereq 15 credits in education

Curriculum and Instructional Technology (Curr)

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 Principles and Practices of Instructional Technology (3 0) Cr 3 F alt SS offered 1995 *Prereq Graduate classification* Utilization of instructional technology in school and corporate settings Analysis of types of hardware and software necessary to design produce present and evaluate instruction with technology Application of research findings relative to instructional technology and learning Preparation of a variety of teaching materials Methods of teaching with technology Materials fee

502 Producing Visual Media Cr 1 to 4 S *Prereq 501* Principles of composition and design of visual instructional media Four one-credit modules in still photography motion photography instructional television and instructional media research Laboratory work in the production of these media Materials fee

503 Designing Instructional Systems (2-0) Cr 2 S *Prereq 501* Designing scripting and producing instructional systems for individual and group instruction Application of principles of programmed instruction Analysis of past and current developments in teaching machines computer assisted instruction hypermedia and instructional development Methods for evaluating instructional strategies

504 Managing and Evaluating Instructional Technology Programs (2-0) Cr 2 F *Prereq Graduate classification* Principles and procedures for analysis of a media/technology program in an education or corporate setting Methods for gathering data developing and evaluating job descriptions analyzing budgets personnel distribution organization of resources circulation and production procedures and physical facilities Development of in service and public relations programs for media/technology centers

505 Microcomputer Applications in Education (2-0) Cr 2 F *Prereq Graduate classification* Classroom teaching techniques using microcomputer software selecting and evaluating software for teaching research on teaching effectiveness tool software trends in computer assisted and computer managed instruction telecomputing language to design instructional materials

506 Multicultural Nonsexist Education in Curriculum Development and Instruction (3 0) Cr 3 Alt F offered 1994 SS *Prereq 15 graduate credits in education* Theories legal bases and principles of multicultural nonsexist education Pluralism and contributing cultures in the United States presence and contributions of cultural group diversity with implications for educational programs curriculum development classroom instruction materials utilization and development problems and issues strategies and techniques research on attending multicultural nonsexist problems

510 Advanced Microcomputer Applications in Education (3-0) Cr 3 S *Prereq 505* Integrating tool software (word processors data base managers spreadsheets communication software desktop publishing graphics packages) into the curriculum Logo and creating computer microworlds for the classroom Integrating CBI software into the curriculum Designing and conducting educational computing workshops

511 Teaching Assistants' Orientation Seminar (U St 511) (1 1) Cr 1 F S *Prereq Graduate classification* Survey of basic techniques of college teaching for graduate teaching assistants who have no background in teaching Videotaped microteaching experiences methods of lecturing conducting discussion questioning and reinforcement simple media production and classroom testing and evaluation

542 The Secondary School Curriculum (2 0) Cr 2 F SS *Prereq Teacher licensure* Curricular and co-curricular programs of secondary schools recent trends in goals content organization and organization for instruction local community resources as curriculum content

545 The Elementary School Curriculum (2-0) Cr 2 F SS *Prereq Teacher licensure* Curricular and co-curricular programs of elementary schools recent trends in goals content organization and organization for instruction local community resources as curriculum content

558 Computer Supported Learning (ResEv 558) (3-0) Cr 3 F *Prereq 505 or one college level course in computer programming* Instructional

computer applications research and theories The design and development of computer based curriculum materials using a high level authoring language on microcomputers

590 Special Topics Cr 1 to 3 *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education

591 Supervised Field Experience Cr 1 to 3 *Prereq 9 graduate credits in education* Supervised on the job field experience in special areas

593 Workshops Cr 1 to 3 *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education
G Gifted Education

594 Principles of Curriculum (2 0) Cr 2 F alt SS offered 1995 *Prereq Teacher licensure* Definitional theoretical and historical consideration of the curriculum representative curriculum models and modes of inquiry foundational issues epistemology society and individual

596 Problems of Curriculum Development (2-0) Cr 2 S alt SS offered 1994 *Prereq 594 or 4 credits of graduate work in curriculum* An analysis of principles and issues related to curriculum construction and evaluation models in the areas of assessment development and implementation

599 Creative Component Cr 1 to 3 *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education

Courses for Graduate Students, major or minor

615 Seminar (0 2) Cr 1 F S SS *Prereq Teacher licensure* Selected topics in curriculum and instructional technology an analysis of research potential evaluation of impact upon the profession implications for additional research

663 Analysis of Teaching (2-0) Cr 2 Alt S offered 1995 *Prereq 6 graduate credits in education* Critical examination of various systems for studying and evaluating teaching descriptive studies and conceptual systems of teaching their nature and possible uses major research attempts to assess teaching effectiveness along with ensuing problems connected with such efforts

690 Advanced Special Topics Cr arr *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education

699 Research Cr arr *Prereq 9 graduate credits in education*
A Curriculum
B Instructional Technology
C Science Education
D Secondary Education
E Environmental Education
F Multicultural Education

Design Studies

Rabindra N Mukerjea Program Coordinator

The College of Design offers the interdisciplinary program in design studies The program provides (a) a general design education which encompasses an interdisciplinary design core curriculum for all students of the college (b) enrichment through elective courses to the programs offered by the college s four departments and (c) service courses open to students in other colleges The program offers undergraduate and graduate coursework While no degree program is available in interdisciplinary design studies an undergraduate minor is offered to all interested students

Undergraduate Study

Courses listed below are offered for students in all university curricula

Graduate Study

The following courses are offered for minor graduate credit 426

Courses Primarily for Undergraduate Students

110 Orientation (1-0) Cr R F S Overview of curricula offered by the College of Design Career opportunities in the disciplines of the college and orientation to the college s departments Required for open curricula students in the College of Design

121 History of Design (3-0) Cr 3 F S SS Study of issues and artifacts their relation to the traditional and changing role of the creators and to western culture

129 Design and Society (3-0) Cr 3 F S SS Creativity and the problem solving process Design issues and the roles artists and designers play in society Materials fee

201 Introduction to Computer Applications (2 2) Cr 3 F S SS Survey of applications of the computer in the disciplines of the College of Design Current and potential applications and their impact Projects involving design-thinking with impact from computer technology and hands-on experience through basic applications

426 Criticism of Design (3-0) Cr 3 F S *Prereq Arch 221 or Art 280 or C R P 383 or L A 271* Developing and exercising a process of critical evaluation of designed objects varying in size and complexity

446 Interdisciplinary Design Studio (0 12 to 18) Cr 4 to 6 F S *Prereq Junior classification in a curriculum in the College of Design and permission of instructor* Interdisciplinary design problems of increased complexity Field trip fee Materials fee

480 Topical Studies in Design Cr 2 to 4 *Prereq Permission of instructor* Thematic or topical studies courses taught by faculty from more than one discipline
H Honors

490 Independent Study Cr 2 to 4 each time taken F S SS *Prereq Permission of instructor advance reservation* Investigation of an approved topic commensurate with the student s interest and ability
H Honors

Courses Primarily for Graduate Students

501 Design Studies Seminar (2-0) Cr 2 F *Prereq Admission to a graduate program in the College of Design* Interdisciplinary inquiries into current issues attitudes and explorations in design and art disciplines

526 Criticism of Design (3-0) Cr 3 F S *Prereq Admission to a graduate program in the College of Design* Development of critical evaluations of designed objects and sites of increasing complexity

546 Interdisciplinary Design Studio (0 15) Cr 5 to 6 each time taken maximum of 12 F S SS *Prereq Admission to a graduate program in the College of Design and permission of instructor* Advanced interdisciplinary design problems Field trip fee materials fee

580 Advanced Topics in Design Studies Cr 2 to 5 each time taken maximum of 10 *Prereq Permission of instructors* Thematic or topical studies taught by graduate faculty from more th in one department

590 Special Topics Cr 2 to 5 each time taken maximum of 10 F S SS *Prereq Permission of instructor and major professor* Investigation of an approved topic commensurate with the student s interests and ability

599 Creative Component Cr var F S SS

699 Interdisciplinary Research in the College of Design Cr var F S SS

Ecology and Evolutionary Biology

(Interdepartmental Graduate Major)

Supervisory Committee T W Jurik Chair W R Clark J J Obrycki R C Schultz K C Shaw S E Taylor R S Wallace

The ecology and evolutionary biology interdepartmental major is offered through a faculty housed in six life science departments in two colleges of the university Faculty from the departments of Agronomy Animal Ecology Botany Entomology Forestry and Zoology and Genetics cooperate to offer courses and research opportunities leading to the M S and Ph D degrees with a major in ecology and evolutionary biology

Applicants should have completed an undergraduate or master of science or arts degree in one of the biological physical or mathematical sciences or should have equivalent preparation Students with degrees in the physical or mathematical sciences should have taken undergraduate courses in both basic ecology and evolution

Students majoring in ecology and evolutionary biology may prepare themselves for careers focused on basic or applied ecology and evolutionary biology in a variety of settings including academia government industry, and private organizations For example, graduates often work in wetland restoration and management conservation of biodiversity and ecological systems natural resource and wildlife management environmental analysis and management forestry and agriculture

The ecology and evolutionary biology major is designed for students interested in the study of mechanisms controlling the composition structure and functional processes of ecological systems and the mechanisms that regulate the pattern and rate of evolutionary change within and among species Cooperating departments offer courses in physiological population, community ecosystem, and landscape ecology, aquatic and wetland ecology forest ecology agroecology, animal behavior wildlife and resource management systematics and

evolution In addition a core of interdisciplinary ecology and evolutionary courses is offered including a special topics course a seminar and an extended field trip

Information on application procedures research interests of the faculty and specific requirements of the major can be obtained from the chair of the supervisory committee

Courses for Graduate Students, major or minor

585 Extended Field Trip (0 6) Cr 2 F S *Prereq Graduate classification* Annual field trip to a region of North America to study the major terrestrial and aquatic ecosystem types of the region Usually *taken during spring semester break Report* required Field trip fee

590 Special Topics Cr 1 to 3 each time taken *Prereq Graduate classification and permission of instructor*

698 Seminar (1 0) Cr 1 each time taken F S Reports and discussion of recent research and literature

699 Research

Economics

Dennis R Starleaf Chair of Department

Professors J Adams R Adams Baumel Duffy Edelman Edwards Enders Faden Fletcher Fuller Ginder Gratto Harl Hayenga Huffman Johnson Jolly Kliebenstein, Lapan Luckett Mattila Merrill Meyer Meyers Otto Paulsen Prescott Sandler Scott Starleaf Stephenson Stone Tesfatsion Thomas Vandewetering Wisner

Emeritus Professors Beneke Fox Howell Julius Kolmer Ladd Skadberg Stoneberg Timmons

Associate Professors Antonovitz Choi Deiter Falk Gallagher Hallam Hammond Hayes Jensen Moschini Orazem Quirmbach Schroeter Shogren Walker

Emeritus Associate Professor Pounds

Assistant Professors Babcock Fulginiti Herriges Lawrence Liu

Undergraduate Study

The department offers work for the degree bachelor of science with a major in agricultural business and for the degrees bachelor of science and bachelor of arts with a major in economics For further discussion of programs in agricultural business see the statement under *College of Agriculture* For programs in economics see the statement under *College of Liberal Arts and Sciences*

College of Agriculture

For the undergraduate curriculum in agricultural business see *College of Agriculture Curricula*

Students majoring in agricultural business must select one area of emphasis from economic analysis farm management agribusiness management, agricultural finance agricultural sales and marketing natural resources agricultural accounting or foreign agriculture The area of emphasis requirement is waived for students completing either a double major (other than Econ) or a minor The curriculum prepares students for advanced studies and for careers in farm and ranch operations commercial farm management and appraisal agricultural finance agricultural supply and marketing industries research for business firms agricultural reporting and public relations, agricultural extension and government service

College of Liberal Arts and Sciences

Candidates for either the bachelor of science or the bachelor of arts degree with a major in economics must fulfill requirements established by the College of Liberal Arts and Sciences (For details of undergraduate curricula in liberal arts and sciences see *Liberal Arts and Sciences Curriculum*)

Bachelor of Science Degree

Within the mathematical and natural sciences group the bachelor of science degree requires Math 165 166 and 265 Stat 227 and 328 and Com S 103 Twenty-seven credits in economics are required for the bachelor of science degree in economics These 27 must include Econ 205 206 401 and 402 B S majors must maintain a C average in 205 206 401, and 402 with no grade lower than a C–

Bachelor of Arts Degree

Within the mathematical and natural sciences group the bachelor of arts degree requires Math 150 and 160 Stat 227 and Com S 103 The degree bachelor of arts in economics should include a broad array of courses outside the Department of Economics in the social sciences group and the arts and humanities group and must include Hist 381 and 382 Twenty-seven credits in economics are required for the bachelor of arts degree These 27 must include 205 206 301 (or 401) and 302 (or 402) B A majors must maintain a C average in 205 206 301 (or 401) and 302 (or 402) with no grade lower than a C–

Typical progress for both B A and B S candidates would be to complete the principles sequence 205 and 206 in the freshman year B A candidates should also complete Math 150 and 160 in the freshman year followed by the intermediate theory sequence 301 and 302 in the sophomore year B S candidates are advised to take Math 165 and 166 in the freshman year and *Econ 401 and 402 and Math 265 in the* sophomore year Com S 103 is recommended in the sophomore year for both and the respective Stat requirements should be completed no later than the end of the junior year Electives at the 300- and 400-level should be taken in the junior and senior years

A minor in economics is offered Courses to be included in the minimum of 15 hours are Econ 205 206 301 (or 401) and 302 (or 402)

English proficiency requirement For the B A and the B S the department requires a grade of C or better in each of the following English courses 104 105 (or 105H) and 314 For the B A there is an additional requirement of a grade of C or better in Engl 204

The department participates in the interdepartmental programs in international studies and women s studies

Graduate Study

The department offers the degrees master of science and doctor of philosophy with majors in economics and agricultural economics The department also offers minors to students with majors in other departments

Students do not need to have an undergraduate major in economics or agricultural economics in order to qualify for graduate work in the department However students must have completed undergraduate coursework in macroeconomics microeconomics and calculus Background in statistics and matrix algebra is preferred particularly for the Ph D

Candidates for the degree master of science (thesis option) are required to complete satisfactorily 30 credits of acceptable graduate work including preparation of a thesis

Candidates for the degree master of science (non-thesis option) may fulfill requirements by satisfactorily completing 36 credits of coursework including preparation of a creative component

Programs of study for the doctorate are organized by each student in consultation with the major professor and the individual s committee Students may select fields of concentration from the following agricultural marketing consumption and demand analysis econometrics economic development financial markets and monetary economics industrial organization international economics labor economics mathematical economics natural resources and environmental economics public finance agricultural policy production economics

Each student must complete advanced courses in microeconomic and macroeconomic theory and two fields in economics from the list above Students must also participate in workshops All students must demonstrate competence in theory either by passing qualifying exams or by achieving outstanding grades in theory coursework Examinations are required in the two fields selected from the list above At the discretion of the student s program of study committee *a master s degree in another* discipline may be substituted for one of the fields

With the cooperation of the College of Law at Drake University a joint degree consisting of doctor of jurisprudence and master of science in agricultural economics or economics may be pursued concurrently Other cooperative programs of study may be arranged with the University of Iowa College of Law or other recognized institutions

The department cooperates in the interdepartmental programs in business administrative sciences and industrial relations the interdepartmental major in transportation planning and interdepartmental minors in gerontology housing mineral resources and technology and social change

Courses open to graduate students for minor credit only 301 302 355 401 402 404 405 411 421 430 435 436 445 446 447 448 451 452 461 465, 480 493

Courses Primarily for Undergraduate Students

110 Orientation in Agricultural Business (1-0) Cr R F Orientation course for freshman students in agricultural business

130 Farm Business Organization and Resource Management (4 0) Cr 2 S 8 weeks For winter programs in ag studies—farm operation only Economic and business principles applied to farmer decision making Farm records and accounting practices for farm business management Forms of farm business organization Managerial decisions involving land and capital acquisitions and improvements Sources and uses of funds for the farm business Methods of reducing farm production and financial risks

131 Farm Financial Analysis and Tax Management (4-0) Cr 2 S 8 weeks For winter programs in ag studies—farm operation only Enterprise whole farm partial and cash flow budgets Construction and evaluation of farm net worth and income statements Farm income taxation analysis and management The use of computers in farm decision making

135 Agricultural Marketing for Farm Operations (2-0) Cr 2 S For winter programs in agricultural studies—farm operation only Basic elements of producer marketing of major Midwest crops and livestock with emphasis on formulating marketing goals and plans Marketing alternatives including the use of futures markets and forward contracts Basic price analysis and price forecasting techniques

192 Agribusiness Operations (4-0) Cr 4 F Introduction to basic business management concepts and economic principles related to the operation of agricultural firms Economic overview of agriculture and agribusiness functions of management the role of agriculture in the U S economy and international trade financial management marketing merchandising agricultural policy personnel management Visits to representative agricultural businesses Field trip fee

201 Principles of Economics (4-0) Cr 4 F S SS Meaning purpose and role of economics demand and supply national income and employment inflation fiscal and monetary policy the banking system pricing and the market system market structures international trade balance of payments and rates of exchange Not recommended for students planning to take additional courses in economics Credit for either 201 or 205 (or 206) but not both may be applied toward graduation

205 Principles of Macroeconomics (3-0) Cr 3 F S SS Introduction to resource allocation demand and supply national income and employment inflation and price levels fiscal policy monetary policy and the operation of the U S banking system elements of international finance including balance of payments and exchange rate determination Credit for either 201 or 205 but not both may be applied toward graduation

206 Principles of Microeconomics (3-0) Cr 3 F S SS Theories of production and consumption pricing and the market system perfect and imperfect competition business and labor regulation issues within the capitalistic system such as problems of poverty housing and the environment Comparative advantage and elements of international trade Credit for either 201 or 206 but not both may be applied toward graduation

301 Prices and Resource Allocation (3-0) Cr 3 F S SS *Prereq 206* Theory of consumer and business behavior optimal consumption choices and demand theory of firm behavior costs production and supply competitive and imperfectly competitive markets theory of demand for and supply of factors of production general equilibrium analysis Credit for either 301 or 401 but not both may be applied toward graduation

302 Monetary and Macroeconomics (3-0) Cr 3 F S SS *Prereq 205 206* Theory of income employment interest rates and the price level fiscal and monetary policy budget and trade deficits money and capital inflows interest rates and inflation Credit for either 302 or 402 but not both may be applied toward graduation

304 Money and Banking (3-0) Cr 3 F S SS *Prereq 205 206* Fundamentals of financial markets financial institutions the money supply process the federal reserve system and the conduct of monetary policy monetary theory international finance

306 Comparative Economic Systems (3 0) Cr 3 F *Prereq 205 206* Analysis and comparison of variants of capitalism including effects of government intervention on private economic activity growth incentives and income distribution Analysis of the transition to market economies by centrally planned economies based on planned socialism Economies examined include those of the United States China Japan Eastern and Western Europe and Russia

310 Economics of Imperfect Competition Antitrust and Regulated Industries (3-0) Cr 3 S *Prereq 206* Structure conduct and performance of industries Analysis of American antitrust laws and government regulation of industries

312 History of Economic Thought (3-0) Cr 3 S *Prereq 206* The logic and explanatory value of received economic doctrines since the middle of the eighteenth century The reflection of past economic doctrines in contemporary theory and policy Discussion of major works by Smith Ricardo Mill Marx Marshall Walras Wicksell and Keynes

330 Farm Planning Production and Organization (3 2) Cr 4 F S *Prereq 206 Acct 284* Business and economic principles applied to decision making and problem solving in the management of a farm business Cash flow partial enterprise and whole farm budgeting Information systems for farm accounting analysis and control Obtaining and managing land capital and labor resources Alternatives for farm business organization

335 Agricultural Marketing and Price Analysis (3 2) Cr 4 F S SS *Prereq 206 301 (or 401)* Agricultural markets and marketing systems Agricultural prices demand supply and price determination Marketing margins Product quality and grading Markets over space location transportation and spatial price equilibrium Markets over time storage price relationships and forecasting Futures markets price discovery and risk management Information and marketing strategies with futures and options Market structure performance and efficiency in agricultural markets Marketing institutions cooperatives and agricultural policy

338 Dairy Marketing (2-0) Cr 2 Alt F offered 1994 *Prereq 206* Trends in milk production and consumer demand for dairy products industry organization and performance federal milk marketing orders dairy price support programs dairy cooperatives component pricing promotional efforts

341 Agricultural Selling (3 0) Cr 3 S *Prereq 206* Principles of selling with application to agricultural businesses Attitudes value systems and behavioral patterns that relate to agricultural sales Relationship of sales to marketing selling strategies preparing for sales calls making sales presentations handling objections and closing sales Analysis of the buying or purchasing process Evaluation of agri selling as a possible career choice

355 International Economics (4-0) Cr 4 F S *Prereq 205 206* Analysis of pattern and benefits of international trade in relationship to employment factor prices and growth International cartels monopolies and governmental policies toward trade such as tariffs quotas and common markets Balance of payments deficit surplus and exchange rate policies Analysis of devaluations international role of gold Special Drawing Rights (SDR) fixed versus flexible exchange rates history and reform of the international monetary system Credit for either 355 or 454 but not both may be applied toward graduation

380 Natural Resource and Environmental Economics (Env S 380) (3-0) Cr 3 F S *Prereq 206* Natural resource availability use conservation and government policy including energy issues Environmental quality and pollution control policies

381 International Economic History (Hist 381) See *History*

382 United States Economic History (Hist 382) See *History*

392 Career Seminar (1-0) Cr 1 F *Prereq Classification in agricultural business* Career opportunities in the various agribusiness industries Required training and skills needed to perform successfully in different types of jobs within industry Selection and training programs of typical agribusiness firms

401 Intermediate Microeconomic Theory (4-0) Cr 4 F S *Prereq 206 Math 166* Models of consumer demand and the theory of the firm using both graphical and mathematical techniques optimal consumption choices and demand cost production and supply competitive and imperfectly competitive markets analysis of markets for factors of production general equilibrium analysis welfare economics Credit for either 301 or 401 but not both may be applied toward graduation

402 Intermediate Macroeconomic Theory (4-0) Cr 4 F S *Prereq 205 206 Math 166* Macroeconomic modeling of industrialized open economies using both graphical and mathematical techniques determination of output employment interest rates and the general price level inflation and expectation effects business cycles and long run growth internal and external balance current policy issues facing the United States Credit for either 302 or 402 but not both may be applied toward graduation

404 Labor Economics (3-0) Cr 3 F S *Prereq 206 and senior or graduate classification or 301 (or 401)* Survey of contemporary labor market problems and public policy toward labor Economic analysis of topics such as labor supply and hours of work work incentives of transfer programs education and training mobility labor demand and employment minimum wages unions income distribution and relative wages discrimination unemployment and wage inflation

405 Public Finance (3-0) Cr 3 F S SS *Prereq 206* The economic role of governments in market economies The theory of public goods externalities income distribution and income maintenance programs The theory of the effect of taxes on economic behavior descriptions of the structure of the principal U S taxes and current reform proposals

411 Economic Development (3-0) Cr 3 S *Prereq 205 206* Current problems of developing countries theories of economic development agriculture and economic development measurement and prediction of economic performance of developing countries alternative policies and reforms required for satisfying basic needs of Third World countries interrelationships between industrialized countries and the developing countries including foreign aid

421 Cooperatives (2-0) Cr 2 S *Prereq 206* Survey of cooperative activities with emphasis on agricultural cooperatives types of cooperatives methods of organization and operation principles legal and tax aspects cooperative finance economic possibilities and limitations of cooperation Field trip fee

430 Advanced Farm Decision Making (3-2) Cr 4 F *Prereq 330 Familiarity with personal computers is helpful but not required* Effective use of decision methods and computer assistance for solving farm problems Applications of economic and management theory to analyze farm production problems using efficiency measures to assess current resource use and direct the farm analysis and planning process Integrating tax management into the farm decision making and problem-solving process Computers as aids in the decision process Materials fee

***433 (533 DL) Agricultural Production Economics** (3-2) Cr 4 S *Prereq 301 (or 401) 430 Stat 227 Math 151* Economic concepts applied to the design evaluation and management of agricultural production technologies Estimation and interpretation of production functions Use of mathematical programming and simulation models for technology assessment Economics of technology adoption and transfer farming systems research and sustainability

435 Agricultural Finance (3 2) Cr 4 F S *Prereq 430 Math 151 Stat 227 Fin 350 and Econ 304 recommended* Financial analysis of agricultural businesses firm growth principles capital budgeting techniques capital theory and investment analysis financial leasing legal aspects in lending financial intermediation and major financial institutions for agriculture credit scoring loan pricing and asset liability management by agricultural lending institutions public policies affecting agricultural credit markets risk management strategies in agriculture farm insurance farm real estate appraisal international dimension of agricultural finance

436 Agribusiness Firm Management (3 0) Cr 3 F S *Prereq 301 (or 401) Stat 227 Math 151* A capstone course in agri business intended to increase students ability to apply economic concepts to decision making within agri business firms in an international economy Problem solving involving quantitative and conceptual analyses of production and investment decisions pricing strategies technological change and the management of risk

***442 (542 DL) Applied Commodity Marketing and Price Analysis** (3-0) Cr 3 S *Prereq 301 (or 401) Stat 227 Math 151* Applied commodity price forecasting futures market theory and hedging strategy evaluation options theory and strategy evaluation

445 Collective Bargaining (3-0) Cr 3 S *Prereq 404* Economic analysis and institutional aspects of unions and collective bargaining Organizing bargaining strategy and contract terms impact of unions on employment and wages Public policy toward unions strikes and negotiated benefits in both the private and public sectors

446 Economics of Discrimination (W S 446) (3 0) Cr 3 F *Prereq 206* Economic theories of discrimination Analysis of the economic problems of women and minorities in such areas as earnings occupations and unemployment Public policy concerning discrimination

447 Agricultural Food and Trade Policy (3 0) Cr 3 F S *Prereq 301 (or 401)* Description and analysis of economic problems of U S agriculture Explanation and economic analysis of government policies and programs to develop agriculture conserve agricultural resources address consumer food concerns stabilize farm prices and raise farm incomes The influence of macropolicy world economy and international trade on U S agriculture

448 Economics of Aging (HD FS 448) See *Human Development and Family Studies*

451 Agricultural Law (3 2) Cr 4 F S *Prereq Senior classification* The legal framework impinging upon decision making by farm firms families and individuals real and personal property contracts secured transactions negotiable instruments debtor-creditor relations bankruptcy organization of farm firms intergeneration property transfers trusts insurance liabilities environmental law federal and state regulatory powers

452 Legal Issues in Agriculture (2-0) Cr 2 *Prereq 206* Off campus Offered as demand warrants The legal framework impinging on decision-making by individuals families and firms in agriculture ownership and transfer of real property commercial law including secured transactions sales and negotiable instruments bankruptcy income tax planning and management estate and business planning for the farm family civil liabilities water law environmental law government regulation of agriculture Designed for off campus programs in agriculture

***454 (554 DL) Issues in International Economics** (3-0) Cr 3 F *Prereq 401 (or 507) 402 (or 506)* Theories of international trade and finance Emphasis on current policy issues in international economics Credit for either 355 or 454 but not both may be applied toward graduation

461 Urban Regional Economics (3 0) Cr 3 F *Prereq 206* Theories of urban development city typologies trade and commuting patterns urban economic interdependence social investment in metropolitan communities regional growth and efficiency locational determinants of firms and households the regional economic base resource development and economic planning in the city region

465 Economics and Educational Systems (2 0) Cr 2 or (3-0) Cr 3 SS and alt S offered 1994 *Prereq 206* Economic problems of public education including production of services resource use and allocative techniques used among and within school systems alternative measures of educational value and resource development through school systems The two-credit section includes discussion of analytical techniques of particular value to specific school situations as represented by class members

470 Public Choice (Pol S 470) (3 0) Cr 3 Alt F offered 1993 *Prereq 206 or 201 and Pol S 251* Application of economics to political science in the study of nonmarket decision making Behavior of bureaucrats elected officials and voters Market failure collective action representative democracies direct democracies logrolling voter paradoxes game theory and terrorism

480 Intermediate Natural Resource and Environmental Economics (3-0) Cr 3 S *Prereq 301 (or 401)* Theories of natural resource utilization and allocation Externalities public goods and environmental quality Planning natural resource use and environmental quality Methodologies for analyzing natural resource and environmental problems

490 Independent Study Cr 1 to 5 each time taken *Prereq Junior or senior classification 14 credits in economics Students in the College of Agriculture may use no more than 6 credits of Econ 490 toward the total of 128 credits required for graduation students in the College of Liberal Arts and Sciences may count no more than 9 credits of Econ 490 toward graduation*
H Honors

***493 (593 DL) Workshops** Cr 1 to 3 each time taken *Prereq Permission of instructor*

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*See page 119 for information on dual listed (DL) courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 502 Microeconomic Analysis I II (4 1) Cr 4 each 501 F 502 S *Prereq 501 Coursework in quantitative methods in economic analysis 502 501* Economic theory and methodology theory of consumer behavior theory of the competitive firm supply and factor demand duality relations in consumer and producer theory partial equilibrium analysis stability and comparative statics general equilibrium analysis efficiency and welfare market failures externalities and the theory of the second best theory of imperfect competition applications of game theory to economic analysis uncertainty and economic theory consumer portfolio and savings decisions under uncertainty producer output and factor demands under uncertainty value of information

503 Macroeconomic Analysis (4 1) Cr 4 F *Prereq 402 and 504* Analysis of static and dynamic models of aggregate economic activity with an emphasis on the role of fiscal and monetary policies on the determination of GNP and its distribution the price level and labor employment

504 Quantitative Methods in Economic Analysis I (4-0) Cr 1 F *Prereq 301 (or 401)* Economic applications of selected concepts of finite mathematics differential calculus with emphasis on optimization and integral calculus

505 Quantitative Methods in Economic Analysis II (3-0) Cr 3 F *Prereq 504 or equivalent background in calculus* Introduction to elements of nonlinear programming comparative static analysis difference and differential equations probability statistics and game theory useful for micro- and macroeconomic modeling

506 Macroeconomics (4 0) Cr 4 F *Prereq Credit or enrollment in 504 or equivalent background in calculus* Models of aggregate supply and demand theories of consumption and investment money supply and demand inflation rational expectations stabilization policy financial markets and international finance This course is designed to be a masters level one semester survey of topics in macroeconomics

507 Microeconomics (4-0) Cr 4 S *Prereq 301 (or 401) 504 or equivalent background in calculus* The theory of the consumer theory of the firm perfect and imperfect competition welfare economics and selected topics in general equilibrium and uncertainty This course is designed to be a master s level one-semester survey of topics in microeconomics

510 History of Economic Analysis (3-0) Cr 3 F *Prereq 301 (or 401) and 402* The ideas of great economists from the eighteenth to the twentieth centuries Adam Smith David Ricardo Thomas Robert Malthus John Stuart Mill Karl Marx William Stanley Jevons Leon Walras John Bates Clark Thorstein Veblen Alfred Marshall John Maynard Keynes and John R Hicks

511 Business Economics (3-0) Cr 3 F S SS *Prereq 205 206 and enrollment in MBA or BAS program not for economics majors* Economic analysis of business problems applications of microeconomic theory and decision analysis Forecasting demand analysis production and cost analysis pricing market structures and capital investment analysis

515 Industrial Organization I (4-0) Cr 4 Alt F offered 1994 *Prereq 501* Theoretical and empirical studies of industry structure conduct and performance Monopoly review of game theory oligopoly collusion mergers and cartels concentration and performance entry barriers and deterrence contestable markets vertical integration and contractual alternatives

516 Industrial Organization II (3-0) Cr 3 Alt S offered 1995 *Prereq 515* Theoretical and empirical analyses of industry structure conduct and performance Technological innovation and diffusion patents and licensing monopolistic competition spatial markets price discrimination regulation and regulated industries

520 Labor Supply and Human Capital Formation (3 0) Cr 3 Alt S offered 1994 *Prereq 501 or 507* Labor supply decisions and empirical analysis for agricultural operators and wage earning households multiple job holding resource allocation in productive households human capital formation by households firms and public institutions which includes schooling on the-job training migration health research raising of children and implications for household income and welfare applications to problems in rural areas of developing and developed countries

525 Advanced Farm Management (2 0) Cr 2 Offered off campus as demand warrants *Prereq 6 credits in economics* Management techniques of planning implementation and control as applied to farm businesses Quantitative tools as applied to agricultural decision making Accounting control concepts and decision theory as used to manage agricultural enterprises Designed for master of agriculture program only

526 Issues in Government Policy Affecting Agriculture (2-0) Cr 2 Off campus Offered as demand warrants *Prereq 206* Government policy and the policy making process as it affects food agriculture and trade Description and analysis of government policies and programs designed to address production agriculture problems and consumer food concerns Evaluation of the

interaction of agriculture and world trade as affected by U S and foreign government policies Designed for master of agriculture program only

531 Agricultural Marketing (3 0) Cr 3 F *Prereq 501 or 507 or 511* Analysis of agricultural marketing systems focusing on their structure pricing and coordination mechanisms (including futures markets) and performance Government market intervention and regulation methods Comparison of market mechanisms and problems in the U S and centrally planned or developing countries

***533 (433 DL) Agricultural Production Economics** (3 2) Cr 4 S *Prereq 301 (or 401) 430 Stat 227 Math 151* Economic concepts applied to the design evaluation and management of agricultural production technologies Estimation and interpretation of production functions Use of mathematical programming and simulation models for technology assessment Economics of technology adoption and transfer farming systems research and sustainability

534 Mathematical Programming in Agricultural and Applied Economics (3 0) Cr 3 Alt F offered 1994 *Prereq 3 credits in economics at the 400 level or above and permission of instructor* Linear programming and the Simplex method sensitivity analysis and parametric programming goal programming stochastic programming and other extensions of linear programming input-output and interregional models nonlinear and quadratic programming to reflect production marketing and financial risk comparison with other criteria for making risky decisions integer programming and investment analysis use of recursive and dynamic programming in long term planning and farm firm growth models

535 Applied Agricultural Marketing (2-0) Cr 2 Off campus Offered as demand warrants *Prereq 6 credits in economics* Market structure and performance in the food and agricultural sector Vertical coordination systems and pricing systems in agriculture Market information and price forecasting Alternative marketing methods and strategies for major Iowa agricultural commodities including the use of futures market Designed for master of agriculture program only

538 Econometric Statistics (Stat 538) See *Statistics*

539 Game Theory (Stat 539) See *Statistics*

540 Operations Research Methods and Economic Analysis (Stat 540) See *Statistics*

***542 (442 DL) Applied Commodity Marketing and Price Analysis** (3-0) Cr 3 S *Prereq 301 (or 401) Stat 227 Math 151* Applied commodity price forecasting futures market theory and hedging strategy evaluation options theory and strategy evaluation

544 Theory of Public Goods and Externalities (3-0) Cr 3 F *Prereq 501 or 507* Pure public goods and local public goods optimality conditions for an economy with public goods market and club provision of excludable public goods externalities and common property resources preference revealing mechanisms fiscal federalism public choice decision making

545 Economics of Taxation (3 0) Cr 3 S *Prereq 501 or 507* Partial and general equilibrium analysis of tax shifting and incidence excess burden and effects of taxes on supplies of labor capital and risk taking alternate bases for taxation and concepts of equity optimal taxation public debt social security

548 Agricultural Price Analysis (3 0) Cr 3 F *Prereq 501 or 507 credit or enrollment in 572 or 573* Specification estimation and application of econometric models for agricultural market analysis Aggregation of individual demand and supply decisions Static and dynamic demand and supply systems Storage and price relations over time Price discovery and risk allocation with futures markets

550 Current Trends in Monetary Economics (3-0) Cr 3 S *Prereq 402 or 506* Various policy issues in monetary economics including commercial bank deregulation and re-regulation international banking the internationalization of financial markets innovations in financial instruments deposit insurance domestic monetary policy and the international coordination of monetary policy

***554 (454 DL) Issues in International Economics** (3 0) Cr 3 F *Prereq 506 507* Theories of international trade and finance Emphasis on current policy issues in international economics

561 Agricultural Policy (3 0) Cr 3 F *Prereq 501 or 507* The instruments and motivations for government intervention in agriculture price and income policies for developed and developing countries instability and stabilization agricultural policy in an open economy government policy choice and implementation

562 Quantitative Research on Agricultural Policy and Trade (3 0) Cr 3 S *Prereq 561* Application of economic theory and quantitative methods and models to the analysis of agricultural policy and agricultural trade problems

568 Evaluation of Development Projects and Policies (3-0) Cr 3 Alt S offered 1995 *Prereq 501 or 507* The project concept financial economic efficiency and social valuation measures of project worth measurement of consumers surplus and factor rents general equilibrium incidence of projects and development policies calculation of systems of social accounting prices review of the evaluation methodologies used by domestic and international lending agencies

572 Introductory Econometrics (3 0) Cr 3 S *Prereq 504 Stat 328 or 401* Single and multiple equation regression models dummy explanatory variables serial correlation heteroscedasticity distributed lags qualitative dependent variables simultaneity Use of econometric models for tests of economic theories and forecasting

573 574 Econometrics I II (3-0) Cr 3 each 573 F 574 S *Prereq 573 501 and Stat 447 or 542 574 573* Specification analysis estimation and evaluation of single and multiple equation models for economic processes issues arising from analysis of nonexperimental and experimental data examination and evaluation of empirical studies published by economists and agricultural economists

575 Bayesian Econometrics (3-0) Cr 3 F Offered twice every three years offered 1994 *Prereq Stat 447* Difficulties with orthodox procedures foundations of Bayesian inference parameter estimation and forecasting Bayesian and post Bayesian hypothesis testing regression models simultaneous equations Bayesian control models

579 Water Resources Planning and Management (W Res 579) (3 0) Cr 3 S *Prereq Permission of water resources supervisory committee* Legal economic sociological governmental and technical aspects of water resources planning and management Water management categories and beneficial use groups water demands for various uses Emphasis on systems of rational allocation among competing demands for water Administered by Economics in cooperation with Political Science and Sociology

580 Economic Development (3-0) Cr 3 F *Prereq 501 and 503 or 506 and 507* Performance of developing countries in terms of growth employment structural changes and social indicators theories and paradigms of development sources of growth policies to promote industrialization and trade role of agriculture farm size and tenure institutions in relation to production efficiency and technology adoptions generation diffusion and impact of agricultural technology population growth and sustainability of development policy distortions and development strategies for growth and equity

581 Current Issues in Economic Development (3-0) Cr 3 Alt S offered 1994 *Prereq 580* Critical appraisal of current problems theoretical contributions and empirical analyses of economic growth and development sectoral analyses identification of research issues review of research methodologies evaluation of alternative development strategies policies and program case studies

590 Special Topics Cr 1 to 5 each time taken

***593 (493 DL) Workshops** Cr 1 to 3 each time taken *Prereq Permission of instructor*

596 Labor Markets (3-0) Cr 3 Alt F offered 1994 *Prereq 501 or 507* Modern analysis of labor demand and market determination of wages and employment analysis of distortions in labor markets due to non-competitive forces legislation and discrimination microeconomic analysis of unemployment and job search

599 Creative Component Cr 1 to 5

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*See page 119 for information on dual listed (DL) courses

Courses for Graduate Students, major or minor

603 Advanced Macroeconomic Analysis (4 1) Cr 4 S *Prereq 503* Introduction to microtheoretic based dynamic and stochastic macroeconomic models applied to the study of economic growth business cycles and governmental policies

605 History of Economic Thought I (3 0) Cr 3 Alt F offered 1994 *Prereq 501 and 503 or 506 and 507* Principal figures in the development of economic ideas contribution of each period of economic thought The Mercantilists to the Classical School inclusive

606 History of Economic Thought II (3 0) Cr 3 Alt F offered 1993 *Prereq 502 and 503 or 506 and 507* Critics of the Classical School to J M Keynes

614 Advanced Theoretical Models I (3 0) Cr 3 Alt S offered 1994 *Prereq 501 502 603* Selected topics in economic theory of current significance to the profession

615 Advanced Theoretical Models II (3-0) Cr 3 Alt F offered 1993 *Prereq 502 603 permission of instructor* Selected current topics in economic theory for advanced students

625 Noncooperative Game Theory and Information Economics (3-0) Cr 3 Alt F offered 1993 *Prereq 501 502* The noncooperative theory of strategic and extensive form games Nash equilibrium subgame perfection and other refinements and other solution concepts such as iterated dominance Supergames Applications in information economics including bargaining auctions signaling and the principal agent problem

632 Advanced Agricultural Marketing Research and Decision Models (3-0) Cr 3 Alt S offered 1994 *Prereq 501 credit or enrollment in Stat 401* Use of statistical economic and other social science models to study marketing problems Applications to public and private decision making

635 Advanced Agricultural Finance (3-0) Cr 3 Alt F offered 1994 *Prereq 502 503 Fin 550 recommended* Concepts and techniques of modern finance theory as applied to agriculture capital budgeting under uncertainty optimal capital structure of farm firms capital markets for agriculture equilibrium pricing of capital assets and options in agriculture investment and finance in agricultural production financial approaches to risk management in agriculture public policy issues related to agricultural credit markets exchange rates and other international finance issues in agriculture rural financial markets for agriculture in developing countries

636 Advanced Topics in Econometrics (3-0) Cr 3 Alt S offered 1994 *Prereq 574 or 538 Stat 543 recommended* Advanced treatment of issues important in theoretical econometrics Topics may include asymptotic theory nonlinear estimation nonparametric and semiparametric methods Monte Carlo experimentation estimation by simulation

641 Advanced Production Economics (4-0) Cr 4 S *Prereq 501 573 534 recommended* Theory and structure of production empirical estimation duality principles supply and demand functions

technological change and productivity non parametric approaches to economic theory stochastic production dynamic production models

642 Production Under Risk (3-0) Cr 3 Alt F offered 1993 *Prereq 502 573 and 574 recommended* Theoretical and empirical examination of the effects of risk on firm decisions Analytical and numerical optimization under uncertainty density function estimation crop yield distributions self protection and self insurance and the role of information

643 Economics of Consumption and Demand Analysis (3 0) Cr 3 Alt S offered 1995 *Prereq 501* Economic theory of consumption with emphasis on the theory the development and estimation of models and the assessment and application of empirical results Demand systems functional forms family budgets equivalence scales composite commodities cost of living indices dynamic processes extensions to the basic economic model and policy applications to marketing regulations food assistance programs poverty nutrition and health

653 Financial Markets and Monetary Economics I (3 0) Cr 3 F *Prereq 502 603* Savings wealth and the valuation of risky assets information and financial markets modeling financial intermediation the operation and regulation of banking institutions financial innovation reform of domestic and global financial institutions

654 Financial Markets and Monetary Economics II (3 0) Cr 3 S *Prereq 502 603* Selected topics in domestic and international aspects of monetary economics Emphasis on the microeconomic aspects of monetary theory and policy and on the current empirical literature

655 International Trade (3-0) Cr 3 F *Prereq 502* Modern theory of international trade welfare and distributional aspects of trade and tariffs The interdependence of international trade and economic growth Optimal trade policies in the presence of such distortions as unemployment monopolies and cartels balance of payments problems infant industries and common market areas

657 International Finance (3 0) Cr 3 S *Prereq 603* The theory of exchange rate and balance of payments determination open-economy macroeconomic issues and current account adjustment Emphasis on the current empirical literature concerning the efficient market theory of the foreign exchange market

660 Welfare Theory (3-0) Cr 3 Alt S offered 1995 *Prereq Credit or enrollment in 502* Notions of economic efficiency equivalence and compensated variation measures consumer and producer surplus market failures social choice path independence compensated demand curves cost-benefit evaluation and public choice

680 Advanced Natural Resource and Environmental Economics I (3-0) Cr 3 Alt F offered 1993 *Prereq 502* Dynamic allocation of scarce exhaustible and renewable natural resources including minerals and energy soil water forests and fish Social versus private decisions Market and nonmarket considerations Technological change Regulation Dynamics and uncertainty

681 Advanced Natural Resource and Environmental Economics II (3-0) Cr 3 Alt S offered 1994 *Prereq 501 502* Interrelationships of natural resource use and the environment Applied welfare and benefit cost analyses Externalities and pollution abatement Nonmarket valuation of resources Property rights Legal and social constraints Policy approaches

690 Advanced Topics Cr 1 to 5 each time taken

693 Workshops Cr 1 to 3 each time taken *Prereq 6 graduate credits in chosen field*

699 Research for Thesis or Dissertation

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*See page 119 for information on dual listed courses

Electrical Engineering

(Administered by the Department of Electrical Engineering and Computer Engineering)

Randall L Geiger Chair of Department

Professors Anderson Basart Brearley Brockman Burns Comstock Dalal Fouad Geiger Hillesland Horton Hsieh Jiles Jones Lamont Lord Papadakis Post Smay Swift S Udpa Vittal Wright

Emeritus Professors Brown Fanslow Hale Koerber Kopplin Nilsson Pohm Potter Read Stewart Townsend Triska

Associate Professors Bond Carlson Davis Hester Jacobson Kleitsch Kruempel Pavlat Russell Sheblé Stephenson Weber

Emeritus Associate Professors Coady McMechan Mericle Scott

Assistant Professors Ajjarapu Chen Davidson Doherty Han Hassoun Hung Khammash Lusk McCalley Mina Patterson Ramabadran Sapatnekar Tuttle L Udpa

Instructor West

Undergraduate Study

For undergraduate curriculum in electrical engineering leading to the degree bachelor of science see *College of Engineering Curricula*

Electrical engineers engage in research development design application management and sales in electrical and associated industries They apply the theories circuits and materials of electrical engineering toward improvements in all of the range of electrical devices methods and systems that render a service to society

The curriculum in electrical engineering has been designed to enable the individual to develop imagination and knowledge in order to enter any of these fields according to individual incentives initiatives and talents

The department offers a cooperative education program that combines classroom learning at the university with practical engineering experience in industry Students in this five-year program complete the regular curriculum requirements for the bachelor of science degree and acquire carefully planned and supervised work experience at one of the cooperating companies The first contact with industry comes after the sophomore year See *College of Engineering Cooperative Programs*

Courses for students who are not in the electrical engineering program 441 447 Credit in these courses may not be counted toward a degree in either electrical engineering or computer engineering

Credit for only one member of each of the following pairs of courses or course sequences may be counted toward graduation 205 206 and 441 351 and 447

Graduate Study

The department offers work for the degrees master of science master of engineering and doctor of philosophy with major in electrical engineering and minor work to students with other majors Minor work for electrical engineering majors is usually selected from a wide range of courses outside electrical engineering The department also participates in the technology and social change interdepartmental minor

The degree master of science requires a thesis and is recommended for students who intend to continue toward the doctor of philosophy degree or to undertake a career in research and development The nonthesis master of engineering degree requires a creative component Students pursuing a doctor of philosophy degree must select one of the following areas of specialization communications and signal processing control systems electric power electromagnetics microelectronics

The normal prerequisite to major graduate work in electrical engineering is the completion of undergraduate work substantially equivalent to that required of electrical engineering students at this university Because of the diversification in the electrical engineering graduate program however it is possible for a student to qualify for graduate study in certain areas of electrical engineering even though the student s undergraduate or prior graduate training has been in a discipline other than electrical engineering Supporting work if required will depend on the student s background and area of research interest Prospective students from a discipline other than electrical engineering are required to submit with the application for admission a statement of the proposed area of graduate study

The department requires submission of GRE aptitude test scores by applicants from other countries All students whose first language is not English and who have no U S degree must submit TOEFL examination scores Ph D students must pass a department qualifying examination

Interdisciplinary programs between electrical engineering and biomedical engineering are provided jointly under sponsorship by the College of Engineering and the College of Veterinary Medicine Laboratory facilities are available at the College of Veterinary Medicine South Campus (See *Biomedical Engineering*)

Open to graduate students for minor credit only all 300- and 400-level courses except 461 462 and 490

Courses Primarily for Undergraduate Students

***205 Electric Circuits I** (3 0) Cr 3 F S *Prereq Enrollment in 235 Math 166 or 176 Phys 221* Resistive circuits operational amplifiers single time constant transients sinusoidal analysis resonance

***206 Electric Circuits II** (3-0) Cr 3 F S *Prereq 205 credit or enrollment in Math 267 or 371* Three phase circuits mutual coupling and transformers Laplace transforms in circuit analysis Fourier series 2 port networks

212 Elementary Electromagnetics I (3 0) Cr 3 F S *Prereq 205 Com S 211 or 205 or Engr 160 Math 265 or 270 Phys 222* Introduction to electric and magnetic field theory Coulomb s Gauss s Ampere s and Faraday s laws Deduction of

Maxwell s Laplace s and Poisson s equations Capacitance and inductance Physical systems for electrical energy transmission Transient signals on transmission lines and application to digital signal transmission

235 Electrical Instrumentation and Experimentation (1 2) Cr 2 F S *Prereq Enrollment in 205* Electrical components and safety Systems for measurement of voltage current power impedance and time Elements of experimental design and techniques for prediction and evaluation of experimental results Notebook and report writing

261 Professional Programs Orientation (1 0) Cr R F S Orientation course for students selected to the professional programs in electrical engineering and computer engineering Overview of the nature and scope of electrical engineering and computer engineering professions Departmental rules advising center operations degree requirements program of study planning career options and student organizations

298 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

309 Electric Network Design (2 2) Cr 3 F S *Prereq 206 235* Graphs and properties of gain and phase functions Characteristics of tabulated filters Scaling and transformations Active network design All pass networks

313 Elementary Electromagnetics II (4-0) Cr 4 F S *Prereq 206 212 credit or enrollment in Math 395* Solutions of Laplace s equation Numerical techniques Partial capacitance Transmission lines in sinusoidal steady state Signal propagation on a dispersive system The uniform plane wave solution of Maxwell s equations Reflection and transmission at planar interfaces Wave interference The transmission line analogy of wave propagation Application to optical communication

330 Electronics I (3 3) Cr 4 F S *Prereq 205 235 Cpr E 280* Overview of semiconductor physics Diode models and applications DC models for bipolar transistor and FET Switching circuits Computer simulation of electronic circuits Basic fabrication processes Comparison of integrated circuit logic families Laboratory design projects

331 Electronics II (3 3) Cr 4 F S *Prereq 330* Bias stabilization small-signal models as applied to linear integrated circuits Mid frequency amplifier analysis Operational amplifier circuitry Frequency response Feedback Computer simulation of electronic circuits Laboratory design projects

***351 Electromagnetic Devices and Electric Machinery** (3-3) Cr 4 F S *Prereq 206 212 235* Magnetic circuit analysis Iron core transformers Force and torque calculations Modeling of electromechanical systems Introduction to electric machines Experiments with and computer simulation of electromagnetic devices

374 Linear Systems Continuous Time and Discrete-Time (4 0) Cr 4 F S *Prereq 206 or 441 Math 267 or 371* Signal representation System description using differential and difference equations State variable representation Convolution sum and integral Fourier analysis Laplace and z transforms Elements of feedback

397 Engineering Internship Cr R F S *Prereq Permission of department* One semester maximum per academic year professional work period

411 Microwave Engineering I (2 3) Cr 3 F *Prereq 235 313* Principles analyses and instrumentation used in the microwave portion of the electromagnetic spectrum S parameters couplers reflectometers network analyzers discontinuities and microwave device equivalent circuits

412 Waves, Radiation, and Antennas I (2 3) Cr 3 F *Prereq 313* Applications of electromagnetic waves and energy Guided waves phase and group velocities dispersion polarization resonators propagation in anisotropic media diffraction radiation Fourier optics Experimental studies of guiding diffracting and resonating devices

413 Microwave Engineering II (2 3) Cr 3 S *Prereq 411* RF amplifier design microwave detectors and mixers microwave sources Optimum noise figure and maximum power designs Microwave filters and oscillators

416 Waves Radiation and Antennas II (2 3) Cr 3 S *Prereq 412* Antenna parameters radiation from wire and aperture sources array theory and design radio transmission formulas modern topics effects of earth and atmosphere on radio propagation Techniques and instrumentation for experimental antenna studies

421 Communication Systems I (3 0) Cr 3 F S *Prereq 331 374 and credit or enrollment in 309* Frequency domain analysis Linear modulation signals receivers transmitters Angle modulation systems Sampling theorem and sampling practice Frequency division multiplex Calculation of signal to-noise ratios System comparisons

422 Communication Systems II (3 0) Cr 3 F S *Prereq 421* Pulse modulation systems Quantization and pulse-code modulation Time division multiplex Information theory coding Data transmission spectral shaping transmission impairments error rates protocols Comparison and evaluation of modulation schemes for data transmission

423 Communication Systems Laboratory (0-3) Cr 1 F S *Prereq 421 credit or enrollment in 422* Construction and evaluation of modulators demodulators modems and other components for analog and digital communications Design and evaluation baseband communications Noise measurement Design and construction of a communication circuit

424 Introduction to Digital Signal Processing (3 3) Cr 4 S *Prereq 374* Fourier transform of discrete time signals Discrete Fourier transform and its application to convolution correlation and spectral estimation Design of IIR and FIR filters Realization of discrete time systems Fast Fourier algorithms and computational complexity Quantization effects in digital signal processing Simulation and real time laboratory experiments illustrating DSP principles and applications

431 Introduction to Microelectronics Fabrication (2-4) Cr 4 SS *Prereq 330* An introduction to microelectronic device fabrication with hands-on laboratory experience to support undergraduate and graduate research requiring this background Students design fabricate and evaluate basic semiconductor materials and devices in a research setting Semiconductor laboratory safety and procedures emphasized

433 Power Electronics (2 3) Cr 3 F *Prereq 331* Use of semiconductor switching devices in AC and DC power control Analysis of controlled rectifiers AC voltage controllers switched mode power converters and DC to AC inverters Applications to switching power supplies lighting controls and motor drives

434 435 Analog Integrated Circuits I II (3 3) Cr 4 each 434 F 435 S *Prereq 434 331 435 434* Integrated circuit technology and its effect on circuit design Internal stabilization Operational amplifiers A/D and D/A converters Multistage amplifiers frequency response feedback stability Noise selected circuit and design applications

436 Digital Integrated Circuits (3 3) Cr 4 F S *Prereq 330* Medium and large scale integrated circuits Integrated circuit memories comparison of various technological constraints and memory system design Displays analog switches A/D and D/A Design and implementation of digital logic systems and interfaces Computer testing of digital integrated circuits

438 Optoelectronics (3-0) Cr 3 *Prereq 313 330 Phys 324* Optical fibers optical detectors and noise light-emitting and laser diodes optical cavities solar cells laser fundamentals Applications of optoelectronic devices

439 Introduction to Physics and Technology of Semiconductor Devices (3 0) Cr 3 F *Prereq Phys 324 or 321 and 322* Concepts of semiconductor physics band theory transport properties mobility carrier concentration doping recombination phenomena Electrical and optical properties of semiconductor materials P N junction theory Schottky carriers ohmic contacts work function heterojunctions Electro-optic devices solid state and gas lasers LED s solar cells photo detectors Bipolar transistors FET s in Si and GaAs Advanced concepts in devices quantum wells superlattices MODFET s Charge coupled devices Semiconductor microwave devices Fabrication techniques

***441 Introduction to Circuits Instruments and Electronics** (3 2) Cr 4 F S SS *Prereq Phys 222 Math 266 or 267* Circuit analysis using network theorems and Laplace transform techniques Transient and sinusoidal steady state circuit behavior Diode circuits Transistor amplifiers Operational amplifiers Other selected topics

***447 Introduction to Electric Machinery** (1 5 1), Cr 2 F S *Prereq 441* Magnetic circuits Power transformers Three phase circuit analysis Basic principles of operation and control of DC induction synchronous and single-phase machines

450 Energy Systems (2 0) Cr 2 F *Prereq Senior classification in engineering* Energy resources U S and world energy supply and demand Electric energy systems organization structure and operation Economics of electrical generation Environmental impact of energy systems

451 Electrical Energy Sources (2-0) Cr 2 S *Prereq Senior classification in engineering* A study of direct energy conversion devices and electrical energy storage methods with emphasis on their utilization in solar electric systems

456 Power System Analysis I (3 0) Cr 3 F *Prereq 351* Power transmission lines network analysis power system representation load flow Power system operation

457 Power System Analysis II (3-0) Cr 3 S *Prereq 456* Power system protection symmetrical components faults stability

461 462 Electrical Systems Design I II (1 3) Cr 2 each F S *Prereq 461 Credit or enrollment in Stat 333 completion of 29 credits in the E E core professional program concurrent enrollment in Engl 314 462 461* Application of the principles and methods of analysis and synthesis in the solution of electrical engineering system design problems with emphasis on a structured design process Engineering applications of business and technical communication Oral and written reports required Materials fee

465 VLSI Basic Layout and Design (Cpr E 465) (3 2) Cr 4 F *Prereq Cpr E 280 credit or enrollment in 436* An introduction to CMOS VLSI layout and circuit design methodologies for custom integrated circuits including layout design rules and using logic timing and analog circuit simulators Delay loading fan-out power and scaling calculations and different VLSI design styles VLSI chip hardware design project

475 Design of Linear Control Systems (3-0) Cr 3 F S *Prereq 374* Design of linear continuous and discrete control systems using root locus and frequency response methods Analysis using modern system simulation languages Lead and lag compensation Rate and state variable feedback Design projects

476 Control System Simulation (1 3) Cr 2 F S *Prereq 475* Basic concepts of feedback control systems simulation using digital techniques

485 Digital System Design (Cpr E 485) See *Computer Engineering*

487 PC Based Interfacing (Cpr E 487) See *Computer Engineering*

489 Computer Networking and Data Communications (Cpr E 489) See *Computer Engineering*

490 Independent Study Cr arr *Prereq Senior classification in electrical engineering* Investigation of an approved topic commensurate with the student s prerequisites
H Honors

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*See credit restriction in undergraduate study section

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

504 Network Synthesis (3 0) Cr 3 Alt S offered 1994 *Prereq 309* Properties of passive networks Passive network synthesis Properties of networks containing linear active elements Synthesis of active networks with emphasis on two ports

506 Integrated Circuit Applications in Biomedical Engineering (B M E 506) (1-2) Cr 2 S *Prereq 441* Analog signal measurement generation and processing using operational amplifiers and other linear ICs Note Not available for degrees in EE

507 Biomedical Instrumentation (B M E 507) (3-0) Cr 3 F *Prereq 206 or 441 credit or enrollment in B M E 525* Characteristics of bioelectric signals pressure signals transducers Biological data acquisition Electrical safety

508 Biomedical Data Processing (B M E 508) (2 0) Cr 2 S *Prereq 206 or 441* Digital data acquisition systems used in biomedical research hardware data reduction algorithms digital filters

510 Topics in Electromagnetics Cr 1 to 3 each time elected
A Antennas
C Microwave Engineering
D Radio Astronomy
F Fourier Optics and Holography
G Optical and Hybrid Optical-digital Computers
H Contemporary Topics

511 Modern Optical Communications (3 0) Cr 3 S *Prereq 313* Propagation in optical media Optical fibers Optical sources and detectors Optical communications systems

512 Advanced Electromagnetic Field Theory I (3-0) Cr 3 F *Prereq 313* Static electric and magnetic fields Solutions of static field problems Maxwell s equations Circuit concepts and impedance elements Propagation and reflection of plane waves in isotropic media Guided electromagnetic waves Characteristics of common waveguides and transmission lines Propagation in anisotropic media

513 Advanced Electromagnetic Field Theory II (3 0) Cr 3 S *Prereq 512* Special theorems and concepts Plane wave functions Cylindrical wave functions Spherical wave functions Perturbational and variational techniques

515 Physical Processes in Plasma (Phys 515) (3-0) Cr 3 F *Prereq 313 or Phys 365* Ionization and breakdown phenomena Description of plasma and basic concepts Collision theory and Debye shielding The Liouville theorem and the Boltzmann equation Macroscopic properties of a weakly ionized gas Diffusion and mobility Particle ballistics in a plasma Solution of the Boltzman equation Plasma diagnostics plasma oscillation Thermionic and plasma diodes The magnetohydrodynamic (MHD) generator The gas discharge and the gas laser

516 Wave Phenomena in Plasma (Phys 516) (3-0) Cr 3 S *Prereq 412 515* Classification and propagation of waves in plasma waves in a bounded plasma waves in anisotropic uniform plasma Wave instability and instability criteria Power flow and energy density in the presence of diffusion and collision Interaction of electromagnetic waves with a gaseous plasma plasma heating Interaction of electromagnetic waves with solid state plasma Instability in semiconductor plasmas Boltzmann equation treatment of semiconductors Acoustic wave instability and diodes

518 Radio Astronomy and Astrophysics (Astro 518) (3-0) Cr 3 Alt S offered 1994 *Prereq 313 or Phys 365* Radio astronomy fundamentals Wave polarization and measurement Radio telescope receivers and antennas Wave propagation in plasmas Synchrotron emission Continuum and line spectra Physical conditions in radio sources

520 Selected Topics in Communications (3 0) Cr 3 each time elected Alt S offered 1994 Advanced topics of current interest in the area of electrical communication systems and theory
A Spread Spectrum Systems
B Satellite Systems
C Radio Navigation Systems
D Two-way Radio Communication Systems
E Commercial Broadcast Systems
F Common Carrier Communication Systems
G Applied Coding Theory and Design
H Lightwave Systems
I Frequency Synthesis
J Electronic Countermeasures
K Radar Systems

521 Advanced Communications Systems I (3 0) Cr 3 F *Prereq 422* Advanced digital communication fundamentals and applications Source encoding encription channel coding multiplexing advanced modulation frequency spreading multiple access channel wireless systems

522 Advanced Communication Systems II (3-0) Cr 3 S *Prereq 422* Spread spectrum systems Frequency hopping and direct sequence Advanced digital signaling techniques Bandlimited channels Signal space methods Coherent frequency sources Amplitude and phase noise Synchronization methods Correlators Code tracking loops Jamming Costas demodulators

524 Digital Signal Processing (3-0) Cr 3 F *Prereq 374* Discrete-time systems and signals Sampling continuous time signals Discrete Fourier transform and its relation to discrete Fourier series and the z transform Linear and circular convolution using the DFT Design of IIR and FIR digital filters and FFT algorithms Computational considerations Spectral estimation Linear prediction Levinson recursion lattice structure Hilbert transform Homomorphic signal processing Computer algorithms and applications of digital signal processing techniques

525 Speech Processing (3 0) Cr 3 Alt S offered 1995 *Prereq 424 or 524* Fundamentals of speech generation and perception Linear prediction theory and concepts of pattern recognition Speech coding pulse code modulation differential pulse code modulation vector quantization sub-band coding transform coding Speech vocoders Speech recognition dynamic time warping hidden Markov models neural networks Speaker recognition Speech synthesis Speech enhancement

526 Information Theory and Coding (3-0) Cr 3 Alt F offered 1994 *Prereq 573 or Stat 333* Self and mutual information Entropy Memoryless sources Markov sources Noiseless source coding theorem Shannon Fano and Huffman codes Discrete memoryless channels Channel capacity Block codes Noisy channel coding theorem Linear codes Generator and parity-check matrices Syndrome based error correction Cyclic codes BCH codes burst-error correcting codes Convolutional codes Viterbi and sequential decoding techniques Rate distortion theory

527 Statistical Communication Theory (3 0) Cr 3 Alt S offered 1995 *Prereq 422* Detection of signals in noise and estimation of signal parameters Random signals narrowband signal models hypothesis testing probability of detection and false alarm binary communication system matched filters error analysis quadrature receiver Costas demodulator Rayleigh fading channel diversity reception Parameter estimation efficiency consistency sufficiency Least squares estimation Bayesian estimation minimum mean-square maximum likelihood maximum *a posteriori* estimators Numerical solutions Applications

528 Digital Image Processing (3-0) Cr 3 S *Prereq 524* Image fundamentals Image transforms—Fourier cosine Karhunen Loeve Stochastic models—autoregression linear prediction Enhancement—histogram equalization smoothing sharpening Restoration—Wiener filter least squares filter maximum entropy Reconstruction—Radon transform back projection computed tomography deconvolution Coding—error free predictive transform Edge detection

529 Selected Topics in Signal and Image Processing (3-0) Cr 3 each time selected F *Prereq 524* Advanced topics of current interest in the area of signal and image processing theory
A Digital Filters
B Spectral Analysis
C Sensor Array Signal Processing
D Artificial Neural Networks
E VLSI Signal Processing
F Radar Grammetric Image Processing
G Pattern Recognition
H NDE Signal Processing

530 Selected Topics in Microelectronics and Photonics (3-0) Cr 3 each time elected S *Prereq 331*
A Semiconductor Material Growth
B Advanced Fabrication Techniques for Devices and ICs
C Band Gap Engineering
D Very High Speed/Frequency Electronics
E Carrier Transport
F Optical Phenomena
G Photovoltaic Energy Conversion
H Power Electronics
I Advanced Electronics Circuits and Devices

531 Semiconductor Device Design and Analysis (3-0) Cr 3 F *Prereq 331 Phys 322 or 324* Semiconductor properties and measurement techniques Bipolar and MOS devices fabrication principles Theory and technology of photolithography diffusion oxidation plasma processing ion implantation epitaxial growth chemical vapor deposition molecular beam epitaxy sputtering and metallization Use of SUPREM for fabrication process flow modeling

532 Fabrication and Characterization of Semiconductor Devices (1-4) Cr 3 S *Prereq 531* Advanced laboratory course Background to design fabrication and characterization of resistors capacitors bipolar junction transistors and field effect transistors Materials fee

535 Semiconductor Device Theory and Technology I (Phys 535) (3-0) Cr 3 F *Prereq 331 Phys 322 or Phys 324* Physics and properties of semiconductors (a resume) crystal structure energy bands carrier concentration at thermal equilibrium Phonon spectra and optical thermal and high field properties of semiconductors Basic equations of semiconductor device operation P N junction diodes bipolar transistors thyristors metal semiconductor contacts Schottky effect ohmic contacts Metal semiconductor field effect transistors (MESFET)

536 Semiconductor Device Theory and Technology II (Phys 536) (3-0) Cr 3 S *Prereq 535* Junction field effect transistors (JFET) Metal insulator semiconductor (MIS) diode Charge-coupled devices (CCD) Tunneling devices IMPATT and related transit-time diodes Transferred electron devices (Gunn Diode) Light emitting diodes (LED) Semiconductor lasers Photodetectors Solar cells

537 Characterization of Semiconductor Materials and Devices (3-0) Cr 3 S *Prereq 439 or 535 or Phys 321 and 322* Properties of semiconducting materials Carrier concentration Mobility measurements Theory and measurement of carrier lifetimes Multi level traps Deep level transient spectroscopy Optical properties Measurement of luminescence Pico and femto-second spectroscopy of semiconductors Structural and chemical measurements Device interfaces

551 Operation and Control of Power Systems (3 0) Cr 3 S *Prereq 457* Power system operating functions economic dispatch unit commitment production costing automatic generation control dispatch of power and reactive power state estimation

553 Steady State Analysis (4-0) Cr 4 F *Prereq 457* Power flow economic dispatch unit commitment automatic generation control sparse matrix techniques interconnected operation voltage control

554 Power System Dynamics (4 0) Cr 4 S *Prereq 457 475* Dynamic performance of power systems with emphasis on stability Modeling of system components and control equipment Analysis of the dynamic behavior of the system in response to small and large disturbances

555 Analysis of Distribution Systems (3-0) Cr 3 S *Prereq 457* Distribution components design criteria secondary networks voltage control protective device coordination surge protection reliability analyses demand side management and distribution automation

557 Power System Protection (3-0) Cr 3 F *Prereq 457* Analog and digital elements of protective systems relaying schemes circuit interrupting devices

558 The Transient Energy Function Method (3 0) Cr 3 F *Prereq 457* Power system transient stability using the transient energy function (TEF) method Behavior of generators following a large disturbance State-of the-art of the TEF method theory tools of analysis and applications to power system problems

565 Systems Engineering and Analysis (Aer E 565 I E 565) (3 0) Cr 3 F *Prereq Graduate classification in engineering* Introduction to organized multidisciplinary approach to designing and developing systems Concepts principles and practice of systems engineering as applied to large integrated avionics systems Life-cycle costing scheduling risk management functional analysis conceptual and detail design text and evaluation and production

566 Avionics Systems Engineering (Aer E 566) (3-0) Cr 3 S *Prereq 565* Avionics functions Applications of systems engineering principles to avionics Top down design of avionics systems Automated design tools

570 Systems Engineering Analysis and Design (3-0) Cr 3 F *Prereq 475 577* Applications of selected topics in abstract algebra linear algebra theory of measure and integration functional analysis and optimization methods in robust and uniformly optimal control theory

573 Random Signal Analysis and Kalman Filtering (Aer E 573 Math 573 M E 573) (3 0) Cr 3 F *Prereq 374 or Aer E 431 or M E 360 or 411 or Math 341 or 395* Elementary notions of probability Random processes Autocorrelation and spectral functions Estimation of spectrum from finite data Response of linear systems to random inputs Discrete and continuous Kalman filter theory and applications Smoothing and prediction Linearization of nonlinear dynamics

574 Optimal Control (Aer E 574 Math 574 M E 574) (3 0) Cr 3 S *Prereq 577* The optimal control problem Variational approach Pontryagin s principle Hamilton Jacobi equation Dynamic programming Time-optimal minimum fuel minimum energy control systems The regulator problem Structures and properties of optimal controls

576 Digital Feedback Control Systems (Aer E 576 Math 576 M E 576) (3 0) Cr 3 F *Prereq 475 or Aer E 432 or M E 411 or 414 or Math 415 and Math 267 or 371* Sampled data discrete data and the z transform Design of digital control systems using transform methods root locus frequency response and direct design methods Design using state space methods Controllability observability pole placement state estimators Digital filters in control systems Microcomputer implementation of digital filters Finite wordlength effects Linear quadratic optimal control in digital control systems Simulation of digital control systems

577 Modern Control Systems I (Aer E 577 Math 577 M E 577) (3 0) Cr 3 F *Prereq 374 or Aer E 431 or M E 414 or Math 415 and Math 307 or 371* State variable and input-output descriptions of linear continuous time and discrete time systems Solution of linear dynamical equations Controllability and observability of linear dynamical systems Canonical descriptions of linear equations Irreducible realizations of rational transfer function matrices Canonical form dynamical equations State feedback State estimators Decoupling by state feedback Design of feedback systems Stability of linear dynamical systems

578 Modern Control Systems II (Aer E 578 Math 578 M E 578) (3 0) Cr 3 S *Prereq 577* Well-posedness of nonlinear control systems Approximate analysis methods Krylov Boguliubov method Poincaré perturbation method and describing function method Lyapunov stability theory Absolute stability of feedback systems Input-output stability Large scale systems

590 Special Topics Cr 1 to 6 each time elected Formulation and solution of theoretical or practical problems in electrical engineering When offered with a letter suffix a topic is designated as follows
A Electromagnetic Theory
B Control Systems
C Communication Systems
D Circuit Theory
E Computer Engineering
F Electric Power
G Electrical Materials
H Electronic Devices and Circuits

594 Seminar in Electric Power Cr 1 to 3 each time elected

595 Seminar in Electromagnetics Cr 1 to 3 each time elected
A Antennas
B Coherent Optics
C Plasmas
D Microwave Engineering
E Radio Astronomy
F Applications to Nondestructive Evaluation

596 Seminar in Control Systems Cr 1 to 3 each time elected

599 Creative Component Cr var

Courses for Graduate Students, major or minor

610 Advanced Topics in Electromagnetics Cr 1 to 3 each time elected
A Antennas
B Electromagnetic Theory
C Microwave Engineering
D Radio Astronomy
E Contemporary Topics

620 Error Detection and Correction (3-0) Cr 3 F *Prereq 527 or Cpr E 584* Mathematical foundation of error detection and correction Shift registers and pseudorandom sequences Group codes cyclic codes Implementation of error detection and correction in digital systems

628 Computer Vision (3 0) Cr 3 F *Prereq 528* Image understanding/computer vision techniques Image to-image and high level image to-representation transformations are used to provide explicit meaningful descriptions of objects in images at various levels of abstraction Image algebra Segmentation techniques boundary region texture Geometrical descriptions Fourier descriptors mathematical morphology surface representation Topological descriptors Euler number connectivity Relational descriptors scene labeling string grammars similarity measures

632 Semiconductor Physics (Phys 632) See *Physics*

635 Quantum Electronics I (3 0) Cr 3 F *Prereq Phys 480 512* Lattice vibration and their quantization electromagnetic fields and their quantization the propagation of optical beams in homogeneous and lenslike media optical resonators interaction of radiation and atomic systems laser oscillation some specific laser systems semiconductor diode lasers quantum well laser and the free electron laser

636 Quantum Electronics II (3 0) Cr 3 S *Prereq 635* Modulation of optical radiation coherent interaction of radiation field and an atomic system introduction to nonlinear optics (second harmonic generation) parametric amplification oscillation and fluorescence third-order optical nonlinearities (stimulated Raman and Brillouin scattering) phase conjugate optics and photorefractive beam coupling Q switching and mode locking of lasers noise in laser amplifiers and oscillators introduction to integrated optics

653 Advanced Topics in Electric Power System Engineering (3 0) Cr 3 each time elected *Prereq Permission of instructor* Advanced topics of current interest in electric power system engineering
A Operation and Control
B Computer Applications
C Dynamics
D System Planning
E Optimization
F Nonlinear Dynamic Analysis

674 Advanced Topics in Systems Engineering (3 0) Cr 3 each time elected *Prereq Permission of instructor* Advanced topics of current interest in the areas of control theory circuit theory stochastic processes digital signal processing and image processing
A Circuit Theory
B System Stability
C Large scale Systems
D System Identification
E Optimal Control
F Nonlinear Systems
G Stochastic Systems
H Discrete-time Systems
I Delay Systems
J Digital Signal Processing
K Image Processing

685 Advanced Topics in Digital Systems (Cpr E 685) (3-0) Cr 3 each time elected *Prereq Cpr E 584* Advanced topics in computing systems taken from current literature

699 Research Cr var

Engineering

(Administered by the Division of Engineering Fundamentals and Multidisciplinary Design)

Michael F Berard Chair of Division

Professors Berard DeJong Eide Jenison Northup Rohach

Emeritus Professors Mashaw Sanders

Associate Professors Day, Dowling Genalo, Hilliard Mercier

Assistant Professors Bolluyt Iasevoli Jacobson Kellenberger Legg Lund Mickelson Moller-Wong Russell Selby Shahan Woolson

Instructors Carson Jensen Knox Leary Starns Stone Wingert

Undergraduate Study

The Division of Engineering Fundamentals and Multidisciplinary Design is responsible for the integration and coordination of areas associated with the basic program (See *College of Engineering*) such as graphical communication design engineering problem solving career orientation and academic assistance The division orientation programs provide information about all engineering disciplines and about computer facilities for engineering students In addition the division facilitates instruction in higher level courses dealing with common knowledge base subject matter not specifically associated with a single engineering discipline

The basic program course offerings provide instruction for all engineering students to prepare them to progress into any curriculum in the College of Engineering Areas of academic study in the basic program include engineering design graphics and engineering

problem solving Engineering design graphics integrates fundamental graphics with an introduction to the engineering design process Study of graphical procedures develops the student s ability to visualize analyze and synthesize various system configurations Design problems are selected that require application of graphical procedures and provide a means for the student to develop a capability to communicate ideas and technical information Computer geometric modeling methods and equipment are used extensively in the study of design graphics

The engineering problem-solving course provides students with skills and techniques for orderly and efficient analysis leading to the solution of engineering problems Computer programming is utilized extensively in the problem-solving process

A series of one-credit courses is designed to introduce engineering workstation and software tools Engineering applications of AutoCAD are provided in a separate course

The engineering law course provides an overview of the legal system with an emphasis on applications to the engineering profession

In addition to the above services the broad range of technical experience within the division faculty makes it possible to offer or *facilitate a variety of courses in support of* other university curricula

Course open to graduate students for minor graduate credit only 380

Courses Primarily for Undergraduate Students

101 Engineering Orientation (1-0) Cr R F S Introduction to the College of Engineering and the engineering profession Considerations in choosing an engineering curriculum Information concerning university and college policies procedures and resources

102 Curriculum Planning (1-0) Cr R F S Curriculum planning for pre computer and pre electrical engineering students Information concerning professional entrance requirements registration procedures and career alternatives

103 Curriculum Planning (1-0) Cr R F S Curriculum planning for pre-construction pre-industrial and pre mechanical engineering students Information concerning professional entrance requirements registration procedures and career alternatives

110 Engineering Orientation to Computing Facilities (1-0) Cr R F S An introduction to computing facilities available to the engineering student at Iowa State University Both hardware and software are introduced

125 Graphic Communications (2-4) Cr 3 F S SS Introduction to various forms of graphic communication used by designers Development of proficiency in technical and design drawing with instruments including layout line quality use of equipment and lettering single and multiview drawings sections and dimensioning pictorial drawing systems with emphasis on perspective Presentation drawings using shades shadows and reflections

135 Technical Drawing (2-4) Cr 3 F S Introduction to graphic fundamentals with emphasis on quality and accuracy Development of technical and design drawing with instruments including use of equipment lettering line quality and layout Use of single and multiview drawings sections dimensioning topography and land measurement Drawing systems for two- and three-dimensional communication of environmental space including isometric oblique and especially perspective pictorials Presentation drawing using shades shadows and reflections

140 Architectural Graphics (2 4) Cr 3 F S SS Technical and design drawing fundamentals using instruments Orthographic projection space geometry and applications Perspective projection and drawing Topography and design drawing conventions Shades and shadows in orthographic and perspective drawings

160 Engineering Problems with Computational Laboratory (2-2) Cr 3 F S SS *Prereq Math 141 142 or satisfactory scores on mathematics placement examinations credit or enrollment in Math 165 or 175* Techniques for solving and presenting engineering problems Graphing and curve fitting Use of SI units Significant figures Flowcharting Solution of engineering problems using the FORTRAN language

170 Engineering Graphics and Introductory Design (2-4) Cr 3 F S SS *Prereq Math 141 142 or satisfactory scores on mathematics placement examinations credit or enrollment in Math 165 or 175* Integration of fundamental graphics computer modeling and engineering design Applications of multiview drawings sections and dimensioning Techniques for visualizing analyzing and communicating 3 D geometries Application of the design process including written and oral reports Freehand and computer methods

190 Special Problems Cr 1 to 3 F S *Prereq Permission of division chair* Graphical and computational topics designed to meet special needs approved by the student s adviser

234 Introduction to Computer Applications in Architecture *(Arch 234)* (1 5) Cr 3 F S *Prereq Credit or enrollment in Arch 201* Computer applications in architecture with an emphasis on graphics computer hardware software and terminology an introduction to the creation manipulation analysis and storage of computer model geometry specification writing using the computer

261 Engineering Workstation Computer Tools (2 2) Çr 1 5 weeks F S *Prereq 160* Engineering applications on a modern network of engineering workstations (Project Vincent) Navigation in the UNIX operating system to perform such tasks as X windows editing and spooling to a printer

262 Engineering Software Tools I (2 2) Cr 1 5 weeks F S *Prereq 160 261 or UNIX workstation experience* The basics of programming on a modern network of engineering workstations (Project Vincent) Programming in the C language with emphasis on engineering problems Use of X windows and other workstation features

263 Engineering Software Tools II (2 2) Cr 1 5 weeks F S *Prereq 160 262 or UNIX workstation experience and C programming experience* Advanced programming concepts on a modern network of engineering workstations (Project Vincent) Engineering discipline-oriented problem solving using the C programming language Advanced application of X-windows and other workstation features

271 Engineering Applications of AutoCAD (2 2) Cr 1 5 weeks F S *Prereq 170* Creating editing organizing and documenting two-dimensional and three-dimensional geometries with AutoCAD

298 398, 498 Cooperative Education Cr R F S SS *Prereq Permission of Engineering Operations Supervisory Committee Chair 298 sophomore classification 398 junior classification 498 senior classification Required of all cooperative education students Students must register for these courses prior to commencing each work period*

380 Engineering Law (3 0) Cr 3 F S *Prereq Junior classification* Introduction to law and judicial procedure as they relate to the practicing engineer Contracts professional liability professional ethics licensing bidding procedures intellectual property and products liability Emphasis on development of critical thinking process abstract problem analysis and evaluation

397 Engineering Internship Cr R F S *Prereq Permission of Engineering Operations Supervisory Committee chair* One semester maximum per academic year professional work period For students in engineering operations curriculum

490 Independent Study Cr 1 to 5 F S *Prereq 160 170 Math 166 and permission of division chair* Independent work with EFMD faculty

Engineering Mechanics

(Administered by the Department of Aerospace Engineering and Engineering Mechanics)

David K Holger Chair of Department

Professors Akers Greer Holger C Hsu D Hsu Huston Inger Iversen Jischke, McConnell McDaniel Munson Naribolı Pierson Rizzo Rogge Rudolphi Schmerr Tannehill D Thompson R Thompson Tsai Wilson Young Zachary

Emeritus Professors Ohlsen Riley Weiss

Associate Professors Hermann Hindman James Mitra Rajagopalan Roberts Rothmayer Seversike Sturges Vogel

Assistant Professors Adams Allaei Budreck Dayal Flatau Gray Lu Mann Sherman

Instructors Todd Younger

Undergraduate Study

The courses in mechanics are intermediate between those in physics and mathematics and the professional and design courses of the several engineering curricula In the work of this department the student is expected to acquire an understanding of the principles underlying the technique of analysis and a knowledge of those properties of materials which influence the manner and extent of their use for engineering purposes Physical properties of engineering materials are studied in the classroom and are evaluated in the laboratory General laws such as those of Newton are given mathematical expression and are made suitable for use in the solution of specific problems in machine and structural design and in the flow and measurement of fluids

Graduate Study

The department offers work for the degrees master of science master of engineering and doctor of philosophy with major in engineering mechanics and minor work to students taking major work in other departments

The master of science degree requires a thesis and a minimum of 8 research credits It has strong research emphasis and is recommended for students who anticipate entering a doctoral program later At least 30 credits of acceptable graduate work are required for the degree

The master of engineering degree does not require either research credits or a thesis However at least two credits of acceptable creative component and at least 26 credits of acceptable graduate coursework are required A minimum of 30 credits of acceptable graduate work is required for the degree The program is intended to give students additional instruction at the graduate level to

better qualify them for advanced professional engineering work By careful selection of electives and perhaps additional courses during the senior undergraduate year, students should be able to qualify for the master of engineering degree with an additional year of full-time study after receiving their baccalaureate degree in one of the several engineering curricula

Credits for creative component will be obtained by registering for E M 599 A written report and an oral presentation will be given to the student s graduate committee

The normal prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this university However because of the diversity of interests in graduate work in engineering mechanics it is possible for a student to qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering—e g physics or mathematics

Cooperative programs between Engineering Mechanics and Biomedical Engineering are provided jointly under the sponsorship of the Colleges of Engineering and Veterinary Medicine Laboratory facilities are available both in the veterinary medicine complex and on the main campus See *Biomedical Engineering* for requirements The department participates in the interdepartmental minor program in mineral resources (See *Index*)

Courses open to graduate students for minor graduate credit only All 300- and 400-level courses except 307 and 490

Courses Primarily for Undergraduate Students

241 Statics and Strength of Materials for Architects (4-0) Cr 4 F *Prereq Completion of the preprofessional program and admission into the professional program in architecture* First in a series of building science courses The function of buildings in resisting common gravitational and climatic forces Statics and mechanics of materials Statically determinate and indeterminate structural members Cannot be used for credit toward graduation in engineering

****274 Statics of Engineering** (3-0) Cr 3 F S SS *Prereq Credit or enrollment in Math 166 credit or enrollment in Phys 111 or 221* Vector and scalar treatment of coplanar and noncoplanar force systems Resultants equilibrium friction centroids second moments of areas Mohr s circle radius of gyration internal forces shear and bending moment diagrams

****301 Fundamentals of Mechanics** (4-0) Cr 4 F S SS *Prereq Phys 221 Math 166* Newton s laws equilibrium of rigid and deformable bodies stress Kinematics and dynamics of particles and rigid bodies Deformation and strain of solids and fluids constitutive equations for solids and Newtonian fluids Applications to tension torsion flexure of solid bars and vibrations

****307 Statics and Dynamics** (5-0) Cr 5 F S *Prereq Credit or enrollment in Math 166 credit or enrollment in Phys 221* Principles of static equilibrium Forces and moments for planar systems Applications to planar problems in trusses beams and machines centroids second moments of areas and friction Dynamics of particles and rigid bodies in planar motion Kinematics of a particle in rectilinear and curvilinear motion Equations of motion energy and momentum methods for a particle Kinematics of rigid bodies Moments of inertia Equations of motion energy and momentum methods for rigid bodies Vibrations

****324 Mechanics of Materials** (3-0) Cr 3 F S SS *Prereq 274 or 307* Plane stress plane strain stress strain relationships and elements of material behavior Application of stress and deformation analysis to members subject to centric torsional flexural and combined loadings Elementary considerations of theories of failure buckling

***327 Mechanics of Materials Laboratory** (0 3) Cr 1 F S *Prereq 301 or credit or enrollment in 324* Experimental determination of mechanical properties of selected engineering materials Experimental verification of assumptions made in 301 and 324 Use of strain measuring devices Preparation of reports

336 Engineering Materials (2-0) Cr 2 F S *Prereq 301 or credit or enrollment in 324* Structure properties and uses of engineering materials with emphasis on construction materials

****345 Dynamics** (3-0) Cr 3 F S SS *Prereq 274 or 301 credit or enrollment in Math 266 or 267* Particle and rigid body kinematics Newton s laws of motion kinetics of plane motion rigid body problems using work energy linear and angular impulse momentum principles vibrations

370 Principles of Nondestructive Testing (M S E 370) See *Materials Science and Engineering*

370L Nondestructive Testing Laboratory (M S E 370L) See *Materials Science and Engineering*

378 Mechanics of Fluids (2 2) Cr 3 F S SS *Prereq 274 or 301 or 307* Properties of fluids Fluid statics Kinematics and kinetics of fluid flow Impulse momentum dimensional analysis flow in pipes and channels Selected laboratory experiments

417 Experimental Mechanics (2 2) Cr 3 F *Prereq 301 or 324* The use of strain gages and brittle coating with applications to practical engineering problems Strain gage based transducers recording and output devices Selected laboratory experiments

424 Intermediate Mechanics of Materials (3-0) Cr 3 F S *Prereq 324* Stresses strains deflections and angular twist of symmetrical and unsymmetrical members subjected to combined loading Analysis of contact stress problems and shrink fit problems Dynamic load effects fatigue and fracture mechanics introduction Stress analysis of connections

425 Introduction to the Finite Element Method (3 0) Cr 3 F S *Prereq 301 or 324 Math 266 or Math 267* Introduction of finite element analysis through applications to one-dimensional steady state problems such as elastic deformation heat and fluid flow consolidation beam bending and mass transport Transient heat conduction and wave propagation Two-dimensional triangular and quadrilateral elements Plane problems of torsion thermal and potential flow stress analysis Simple computer programs for one and two-dimensional problems

444 Mechanical Vibrations (2 2) Cr 3 F *Prereq 324 345 knowledge of FORTRAN* Elementary vibration analysis single and multiple degrees of freedom energy methods free and forced vibrations viscous damping transmissibility matrix methods modal analysis Selected laboratory experiments Numerical methods of solution

451 Engineering Acoustics (M E 451) (2 2) Cr 3 S *Prereq Phys 221 and Math 266 or 267* Sound sources and propagation Noise standards and effects of noise on man Principles of noise and vibration control used in architectural and engineering design Characteristics of basic noise measurement equipment Experience in use of noise measuring equipment sound power measurements techniques for performing noise surveys evaluation of various noise abatement techniques applied to common noise sources Selected laboratory experiments

490 Independent Study Cr arr *Prereq Permission of instructor*
H Honors

*Students who are not present for the first laboratory meeting of their own sections may qualify for continuation in the course only by attending the first laboratory meeting of some other section of the course

**Credit for only one of the sequences (307 324) or (274 324 345) may be allowed for graduation Credit for only one of 274 301 307 may be allowed for graduation

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

504 505 Analytical Methods in Mechanics (3-0) Cr 3 each Yr *Prereq 504 Math 385 505 504* Applications of the equations of heat conduction potential theory and wave propagation to problems in mechanics Methods of solution

510 Continuum Mechanics (3 0) Cr 3 Alt F offered 1994 *Prereq Math 385* Presentation of the basic equations of engineering mechanics conservation of mass conservation of momentum conservation of energy principles of selection of constitutive equations constitutive relations for classical elastic materials and classical fluids simple rheological models for viscoelastic materials introduction to Cartesian tensors

514 Advanced Mechanics of Materials (Aer E 514) (3 0) Cr 3 F *Prereq 324* Theory of stress and strain stress strain relationships Limitations of flexure and torsion formulas unsymmetrical bending curved beams cross shear shear center Torsion of thin walled noncircular sections Theories of failure membrane stresses in shells thick walled cylinders

515 Buckling (3-0) Cr 3 Alt S offered 1994 *Prereq 514* Stability of columns beam-columns bars and frames Inelastic buckling torsional buckling bending and buckling of thin plates and shells

516 Applied Elasticity (3 0) Cr 3 S *Prereq Math 385* Fundamentals of linear continuum elasticity theory formulation and solutions of simple elastostatic boundary value problems Vector and tensor analysis Kinematics of small deformations constitutive laws for isotropic and anisotropic media Field equations for one two- and three dimensional solids Formulation of plane strain/plane stress problems by stress function methods Corresponding solutions to a variety of classic canonical problems such as those of Bickley Boussinesq Hertz Kirsch Lamé Melan and Mitchell

517 Experimental Stress Analysis (3 2) Cr 4 Alt S offered 1995 *Prereq 324* Fundamental concepts of stress and strain measurement strain gage characteristics strain gage circuits and instrumentation strain gage based transducers transmission and reflection photoelasticity two and three-dimensional photoelasticity Moire interferometry methods of measuring displacement and strains

518 Wave Propagation in Elastic Solids (3 0) Cr 3 Alt F offered 1993 *Prereq 516* Introduction to the theory of wave propagation in a linear elastic solid Formulation of one- two- and three-dimensional problems in isotropic and anisotropic media Topics in propagation radiation and scattering theory Time and frequency-domain formulations Green s function methods Approximate and exact solutions of inverse scattering problems

519 Experimental Methods of Motion Measurement (2 2) Cr 3 Alt S offered 1994 *Prereq 417 444* Description specifications limitations and applications of mechanical electrical and optical transducers used in motion measurements applied to steady state transient and shock motions Calibration signal conditioning and transducer systems used to obtain reliable and reproducible experimental data Seismic and absolute references for motion measurement

520 Biomechanics (B M E 520) (3-0) Cr 3 Alt F offered 1993 *Prereq Phys 111 or 221 Math 265* For students with interests in the life sciences who wish to obtain background in applied mechanics Topics include equilibrium vibratory motion stress

and deformation material properties flow of fluids dimensional analysis and modeling of biological systems Illustrative examples taken from biology and medicine

522 Energy Methods in Applied Mechanics (3 0) Cr 3 Alt F offered 1994 *Prereq 514 or 516 and Math 385* Introduction to variational principles and energy methods in applied mechanics Applications in solid mechanics dynamics and elasticity—bars beams torsion and plane elasticity Variational methods of approximation—Ritz s method weighted residuals finite elements Applications in plates shells and components

525 Finite Element Analysis (3 0) Cr 3 S *Prereq 425 Math 385* Variational and weighted residual approach to finite element equations Emphasis on two- and three-dimensional problems in solid mechanics Isoparametric element formulation higher order elements numerical integration imposition of constraints and penalty convergence and other more advanced topics Use of two and three-dimensional computer programs Dynamic and vibrational problems eigenvalues and time integration Introduction to geometric and material nonlinearities

526 Boundary Element Methods in Engineering (3-0) Cr 3 Alt S offered 1994 *Prereq 514 or 516* Introductory boundary element methods through plane problems Singular integrals Cauchy principal values integral representations and boundary integrals in one dimension Direct and indirect formulations Plane potential and elastostatic problems Higher order elements numerical integration Regularizations Body forces and infinite regions Specialized fundamental solutions half-plane and axisymmetric problems Diffusion and wave problems Coupling with finite elements

544 Mechanical Vibrations (2 2) Cr 3 F *Prereq 324 345 Elements of lumped parameter linear* systems kinematics of vibrations equations of motion for free and forced vibrations energy methods resonance damping multiple degrees of freedom mechanical impedance isolation and absorption of vibrations with impulsive and arbitrary excitation of linear systems primary and residual shock spectra Vibration of continuous systems

546 Introduction to Random Vibrations (3 0) Cr 3 Alt S offered 1995 *Prereq 544* Modal analysis nonlinear vibration phenomena Characteristics of random vibrations random processes probability distributions spectral density and its significance the normal or Gaussian random process Transmission of random vibration response of simple single and two-degree-of freedom systems to stationary random excitation Fatigue failure due to random excitation

548 Advanced Engineering Dynamics (3 0) Cr 3 F *Prereq 345 Math 266 or 267* Dynamics of particles and rigid bodies Generalized coordinates *Lagrangian equations of motion* Equations of motion in terms of Eulerian angles motion of a gyroscope

549 Vehicle Dynamics (M E 549) (3 0) Cr 3 S *Prereq 345 Math 266 or 267* Theory and engineering principles of road and off road ground vehicles Analysis and evaluation of performance characteristics handling behavior and ride qualities

550 Fundamentals of Nondestructive Evaluation (M S E 550) (3 2) Cr 4 S *Prereq 301 or 324 Math 385* Basic physics of ultrasonic radiographic and electromagnetic NDE measurements Principles and uses of other quantitative techniques in nondestructive evaluation Signal processing and evaluation methods Laboratory experiments in ultrasonics eddy current and x ray radiography methods of NDE

551 Signal Processing in Mechanics (M E 551) (2-2) Cr 3 S *Prereq 444 or 451 Math 385* Classification and measurement of time dependent phenomena in mechanics Correlation spectral and probabilistic techniques for the analysis of acoustical vibrational and unsteady fluid dynamic phenomena Selected laboratory experiments emphasizing dual channel FFT analyzer applications in mechanics

552 Advanced Acoustics (3-0) Cr 3 Alt F offered 1993 *Prereq 444 or 451* Theoretical acoustics wave propagation in fluids acoustic radiation diffraction and scattering and architectural acoustics Applications of basic acoustic theory in noise control and acoustic radiation Introduction to selected numerical methods in acoustics

555 Biomedical Fluid Mechanics (B M E 555) (3 0) Cr 3 Alt F offered 1994 *Prereq 520* Applications of principles and concepts of fluid mechanics to problems in biology and medicine Hemodynamic characteristics of the circulation rheology of blood flow in the microcirculation flow in the large arteries and the respiratory system

560 Scanning Electron Microscopy Characterization of Materials (2 2) Cr 3 F *Prereq M S E 201* Principles of scanning electron *microscopy and energy dispersive X ray* microanalysis Laboratory microstructural microchemical analyses of materials

564 Fracture and Fatigue (M S E 564 M E 564) (3 0) Cr 3 F *Prereq 324 and any one of 336 E Sci 352 M S E 201 or 271* Materials and mechanics approach to fracture and fatigue Fracture mechanics brittle and ductile fracture fracture and fatigue characteristics Fracture and fatigue tests thermal fracture mechanics and materials designed to avoid fracture or fatigue

568 Plasticity and Creep of Materials (M S E 568) (3-0) Cr 3 Alt F offered 1993 *Prereq 324* Mechanics and materials approach to plasticity and creep stress and strain tensors yield criteria flow rules slip-line theory and work hardening Axially symmetric problems bending thermal load torsion Introduction to creep deformation stress relaxation and recovery problems

569 Mechanics of Composite and Combined Materials (M S E 569 Aer E 569) (3 0) Cr 3 Alt S offered 1995 *Prereq 324* Mechanics of fiber reinforced materials Macromechanical behavior of lamina and laminates Strength and interlaminar stresses of laminates Failure criteria Micromechanics of lamina Stress analysis of laminates Thermal and moisture stresses and residual stresses

571 572 Advanced Fluid Mechanics 571 (3-0) Cr 3 F 572 (3-0) Cr 3 S *Prereq 571 378 or M E 335 572 571* Mass momentum and energy conservation laws of fluid dynamics control volume and differential forms of governing equations real and ideal fluids concepts of stress strain rate and vorticity exact solutions of Navier Stokes equations for steady and unsteady flows low Reynolds number flows boundary layer approximation laminar and turbulent boundary layers two dimensional and axisymmetric potential flow problems elements of compressible flow engineering applications

574 Ultrasonic Nondestructive Measurement Principles (M S E 574) (3-0) Cr 3 F *Prereq 370 516 Math 385* Ultrasonic inspection techniques underlying theory of elastic wave propagation and scattering Transducer modeling and the development of a complete ultrasonic measurement model Fundamental aspects of linear system theory Application to flaw detection and sizing

580 Biomaterials (B M E 580 M S E 580) (3-0) Cr 3 S *Prereq M S E 201* Presentation of the basic chemical and physical properties of biomaterials as they are related to their manipulation by the engineer for incorporation into living systems Role of microstructure properties in the choice of biomaterials and design of artificial organs implants and prostheses

584 Similitude in Engineering (2 2) Cr 3 S *Prereq 324 a fluids course* Principles of dimensional analysis and their application to design of models Design testing and interpretation of true and distorted models Similarity analysis Analogies

590 Special Topics Cr 1 to 4 each time taken *Prereq Permission of instructor*
- A Advanced Engineering Acoustics
- C Thermal Stresses in Design
- D Linear Viscoelasticity
- E Biomechanics
- F Other Topics

599 Creative Component Cr arr

Courses for Graduate Students, major or minor

645 Advanced Vibration Analysis (3-0) Cr 3 Alt F offered 1994 *Prereq 544 Math 385* Multiple degrees of freedom inertia and stiffness matrices transfer matrices numerical methods Vibration of continuous systems limitations and comparison of lumped approximations of continuous systems Engineering applications

648 Advanced Topics in Dynamics (3-0) Cr 3 Alt S offered 1994 *Prereq 548 Math 385* Topics of current interest in dynamics such as vehicle stability modeling multicomponent dynamical systems and nonrigid body dynamics

651 Advanced Topics in Fluid Mechanics (M E 651) (3-0) Cr 3 Alt S offered 1995 *Prereq 571* Topics of current interest in fluid mechanics such as separation phenomena three-dimensional boundary layers unsteady flow phenomena asymptotic methods in viscous flows stability theory of homogeneous isotropic turbulence and turbulence models

690 Special Topics Credit 1 to 6 each time taken *Prereq Permission of instructor*
- A Advanced Experimental Mechanics
- B Nonlinear Wave Propagation
- C Nonlinear Material Behavior
- D Composite Materials
- E Holography in Mechanics
- F Finite Elements of Nonlinear Continua
- G Fracture Mechanics
- H Atmospheric Fluid Mechanics
- I Viscous Flow Theory
- J Advanced Similitude Analysis
- K Advanced Analytic Methods in Mechanics
- L Rheology
- M Other Topics

699 Research

Engineering Science

(Administered by the Department of Aerospace Engineering and Engineering Mechanics)

David K Holger Chair of Department

Professors Akers Greer Holger C Hsu D Hsu Huston Inger Iversen Jischke McConnell McDaniel Munson Nariboli Pierson Rizzo Rogge Rudolphi, Schmerr Tannehill *D Thompson R Thompson Tsai* Wilson Young Zachary

Emeritus Professors Ohlsen Riley Weiss

Associate Professors Hermann Hindman James Mitra Rajagopalan Roberts Rothmayer Seversike Sturges Vogel

Assistant Professors Adams Allaei Budreck Dayal Flatau Gray Lu Mann Sherman

Instructors Todd Younger

Undergraduate Study

For the undergraduate curriculum in engineering science leading to the degree bachelor of science see *College of Engineering Curricula*

The curriculum in engineering science is designed particularly for those students who wish to receive training in a particular field that is not the focus of other majors

Examples are acoustics astronautics avionics biomedical engineering control systems computational and experimental mechanics dynamics/vibrations and nondestructive evaluation These are fields that are a part of other curricula or are part of several curricula The core of a degree in engineering science is a strong technical background in chemistry mathematics, and physics with additional emphasis on communication skills The rest of the basic program incorporates courses in engineering mechanics materials science electrical sciences and thermal sciences A number of technical electives in the junior and senior years allow a student to develop an expertise in the area of particular interest to the student Thus engineering science is for the student who has specific educational goals not accessible in traditional majors

The curriculum is well adapted as a base for those students who wish to enter the research development production or design areas of engineering or who intend to pursue a graduate program By a judicious choice of electives in the junior and senior years it is possible to go on to attain a master of science or master of engineering degree in either two or three additional semesters beyond the bachelor s degree

Graduate Study

Minor work is available to students taking major work in other departments

Open to graduate students for minor graduate credit only all 300- and 400-level courses except 410

Courses Primarily for Undergraduate Students

298, 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative students Students must register for these courses prior to commencing each work period

351 Engineering Materials I (3 2) Cr 4 F *Prereq E M 324* Resistance of materials to failure definitions and evaluation of properties relationship to design Effects of environment on properties Laboratory determinations Structure of materials and influence of structure upon properties

352 Engineering Materials II (3-2) Cr 4 S *Prereq 351 or M S E 201 and 205 or 207* Thermal magnetic and electrical characteristics Properties of single crystals polycrystalline systems aggregates of domains thin films and amorphous solids Interatomic forces energy considerations Engineering applications

382 Experimental Methods in Engineering Science and Mechanics (2 2) Cr 3 S *Prereq E M 324 345 Math 371 Stat 231 knowledge of FORTRAN* Planning design and construction of experiments and experimental apparatus in engineering science and mechanics Interpretation and documentation of experimental results Design project

397 Engineering Internship Cr R F S *Prereq Permission of department chair* Professional work period one semester maximum per academic year

410 Engineering Science Seminar (0 5-0) Cr R F S Seminar in writing industrial employment and graduate school opportunities information concerning GRE EIT and other professional exams time and money management professional ethics social and economic impact of engineering and technology and curriculum matters

481 Senior Engineering Science and Mechanics Design Project I (1 2) Cr 2 F *Prereq 382 Math 481* Development of design project proposal in student s area of specialty in engineering science

482 Senior Engineering Science and Mechanics Design Project II (1-6) Cr 4 S *Prereq 382 481* Continuation of student s design project Formal oral and written presentation

490 Independent Study Cr 2 to 5 *Prereq Permission of department chair* Investigation of an approved problem commensurate with the training interest and ability of the student
H Honors

English

Dale H Ross Chair of Department

Professors Abraham Bataille Bowers Carlson Geha Hadley Haggard McCarthy Nakadate Nostwich Poague Silet Smiley Zbaracki Zimmerman

Emeritus Professors Benson Bruner Davies, Feinberg Herrnstadt J Lowrie McCay Palmer Yates

Associate Professors Allen Anderson-Hsieh Blyler Catron Chapelle Consigny Daly David Douglas Ewald Freed Galyon Gwiasda Hagge Hickok Kent Kienzler Kostelnick Matthies Mendelson Payne Pett Potter Roberts Ross Russell Schwarte Swander Thralls Vann Whitaker

Emeritus Associate Professors Irwin Speer

Assistant Professors Alexander Beatty Boston Burnett D Dunlop M Dunlop Falck-yi Graham Hodges, Irwin Kupfer McCully McDonald Miller Moorer Muhlstein Post Tremmel Wallace Yager

Undergraduate Study

The department offers a wide variety of courses for students seeking a degree in English as well as for students wishing to broaden their general education Course offerings include American British and western world literature basic and upper-level practical and creative writing linguistics rhetoric and professional communication film English education and teaching English as a second language

The discipline of English helps to develop students understanding of how language functions in imaginative literature mass media and both personal and professional writing Many students select English courses to fill electives to pursue a minor to complement their professional training in other departments and to investigate further study in English

Basic courses in the department are designed to improve the skills in comprehension and communication necessary for successful university work (See *Colleges and Curricula Bachelor s Degree Requirements* and *English Proficiency Policy* for information about English and communications requirements for each Iowa State University college program) The English Department has a Writing Center to assist students The curricula in many departments call for coursework beyond the freshman English program

The department offers a variety of special courses in English for speakers of other languages (both undergraduate and graduate students) and participates in the Intensive English and Orientation Program for foreign students (See *English Courses for Native Speakers of Other Languages* and *English Requirement for International Students*)

Students graduating with a major in English or with a large number of courses in English usually find that their career opportunities are improved in fields that demand special communication skills e g publishing public service research and investigation business and technical writing personnel management international relations advertising and marketing finance and public relations An undergraduate major in English is an excellent basis for professional study in law business medicine and theology Students interested in teaching can qualify to teach English in the secondary schools (See Index *Teacher Licensure*) Students who have completed an undergraduate major in English may also pursue graduate studies

The English major aided by an adviser works out a program of study consistent with his or her own educational and professional objectives Majors are required to have (in addition to 104-105 or 105H) at least 37 credits in English those seeking secondary school teaching certification are required to have 46 credits in English apart from required teaching-related courses taken in other departments To graduate in English a student must earn a C (not a C–) or better in **each** of the courses taken to fulfill the minimum requirements of the program of study in English Students who believe they have extenuating circumstances may appeal to the chair of the Department of English

Credits are distributed as follows nine initial courses in English studies literary analysis linguistics rhetorical analysis advanced writing literary or rhetorical theory, British literature American literature and women s and/or minority literature complemented by four advanced courses as specified by the student s option (1) literary studies (2) rhetoric and professional communication and (3) English education All English majors must take at least three courses at the 400 level and at least two courses of pre-1900 literature one of which must be in pre-1800 literature Lists of specific courses acceptable to fulfill the requirements of the major are available in the English Department office Majors who do not declare a minor or a second major are urged to take at least 12 credits in a supporting field such as a foreign language linguistics journalism history philosophy psychology speech communication music sociology anthropology women s studies American Indian studies or business administration English majors may earn a bachelor of arts or bachelor of science degree Beyond the minimum college requirements the B S degree requires 12 credits in linguistics natural science, mathematics social science or selected courses in physical education Details of these requirements are available from departmental advisers

English proficiency requirement The department requires a grade of C or better in Engl 104 and 105 (or 105H) and a grade of C or better in one advanced writing course required for the major (Engl 302-307 309 314-316)

The department offers a minor in English which may be earned by completing at least 18 credits in English courses beyond the 100 level 9 of which are 300-level or above with a grade of C (not C-) or higher in each course taken in the minor

The English Department each year offers several scholarships and awards Most of these are open to all undergraduates and are as follows James and Rachel Lowrie Award Critical Writing Award Pearl Hogrefe Grants-in-Aid Will C Jumper Award W Paul Jones Scholarship Richard R Wright Award Quentin Johnson Award Aubrey Galyon Award Walker Awards for Excellence in English and Freda Huncke Awards

The department participates in the interdepartmental programs in African American studies American Indian studies women s studies linguistics classical studies and technology and social change (see *Index*)

Graduate Study

The master of arts degree program in English offers varied possibilities for the advanced study of writing language and literature There are five optional areas of specialization literature (British and American) teaching English as a second language/linguistics business and technical communication creative writing and rhetoric and composition These areas of specialization are designed to prepare students for teaching at the secondary two-year college or beginning college and university levels for further graduate study in language and literature for teaching English as a second language for creative writing or for technical writing and business communication editing and associated professional writing

The master s degree requires 30 semester credits including a thesis or project (3 credits) and satisfaction of a language requirement that may be met through a number of options including previous foreign language study graduate linguistics courses satisfactory performance on the Graduate Student Foreign Language Test and knowledge of statistical and/or data processing methods A student whose native language is other than English is considered to have met the departmental language requirement

The Ph D in rhetoric and professional communication (RPC) focuses on the theory of rhetoric and the practice of written communication in professional communities such as business industry and government The degree qualifies graduates to accept academic positions in rhetoric and in business and technical writing as well as to work in the private sector as professional writing specialists editors and communications production managers Prospective students must first secure admission to the graduate studies program through the Department of English Candidacy for the RPC program is based on a qualifying exam Candidates are required to complete 72 hours of graduate credit a preliminary exam a dissertation and an oral defense of the dissertation See the RPC informational brochure for a full description of the program and requirements

The department offers graduate students an opportunity to gain professional experience through professional writing internships selected departmental research activities the Intensive English and Orientation Program Freshman English Program and Writing Center Teaching and research assistantships are available for qualified students Teaching assistants are responsible for teaching with faculty supervision classes in freshman composition in English as a second language or in business and technical communication Research assistants are assigned to individual faculty members engaged in projects in writing language or literature Two Pearl Hogrefe Fellowships covering stipend and tuition are awarded each year to outstanding graduate students

The department participates in the interdepartmental minor technology and social change (see *Index*) Selected courses in English may be used to meet part of the requirements for certification to teach English in two-year and community colleges (see department information bulletin)

Open to graduate students for minor graduate credit only 302 309 314 315 316 335 340 341 345 346 347 348 349 357 358 394 395 401 416 420 425 440 441 442 450 451 452 453 460 461 462 463 487

Courses Primarily for Undergraduate Students

10 Intensive English and Orientation Program (20-5) Cr 0 F S SS *Prereq Recommendation of the English Department* Full time study of English for speakers of other languages Brochure available from the Office of International Educational Services Offered on a satisfactory fail basis only

****101 English for Native Speakers of Other Languages** F S *Prereq Recommendation of English Department 101C 101B or placement in 101C 101D 101B or placement in 101D* Placement in various sections is determined by examination (See *English Requirement for International Students* in *Index*) For undergraduates Completion of English 101 requirement prepares for English 104 For graduates Completion of English 101 requirement satisfies the English requirement of the Graduate College

- B Intermediate level Grammar Review and Composition Cr 3 available P/NP to graduate students at their department s option
- C Advanced level Composition—Undergraduates Cr 3
- D Advanced level Composition—Graduates Cr 3 Available P/NP to graduate students at their department s option
- E Supervised Independent Study Cr 1 to 3 each time taken S/F Section 1 Listening Cr var 1 to 2 Section 2 Reading Cr 1

**The university does not allow credit in English 101 to count toward graduation Persons whose native language is English cannot take English 101 for credit

104 105 105H Freshman Composition (3 0) Cr 3 each 104 105 F S SS 105H F *Prereq 105 104 or exemption from 104 105H Exemption from 104 and admission to Freshman Honors Program* Emphasis on development of writing skills Eight to ten writing assignments or the equivalent each semester Readings from a variety of sources

180 Communication Skills for International Teaching Assistants (U St 180) Cr 1 to 3 F S Several sections are offered with assignment based on international teaching assistants communication needs (fluency presentation skills vocabulary etc) Offered on a satisfactory fail basis only Credit for English 180 may not be applied toward graduation Persons whose native language is English cannot take 180 for credit

199 Introduction to the Study of English Cr 1 F S 8 weeks *Prereq 105* General introduction to the discipline discussion of the various fields in English consideration of career opportunities Offered on a satisfactory fail basis only

201 Introduction to Literature (3 0) Cr 3 F S SS *Prereq Credit in or exemption from 104* Emphasis on comprehension of literature and its relation to recurrent human situations Study of selected texts chosen to illustrate differing literary forms Not recommended for English majors

204 Intermediate Composition (3 0) Cr 3 F S SS *Prereq 105 sophomore classification* Developing skills necessary to organize extended pieces of writing Emphasis on expository writing use of research sources and documentation Revision and audience strategies stressed

205 Propaganda Survey and Analysis (3-0) Cr 3 F S SS *Prereq 105* Analysis of how newspapers books magazines radio television and film convey facts beliefs judgments and values Special emphasis on verbal and nonverbal devices employed in the propaganda process Students may be required to purchase selected periodicals attend evening film screenings and view certain television programs Materials fee

210 Introduction to Literary Study (3-0) Cr 3 F S *Prereq Credit in or exemption from 104* Basic *principles of literary study Emphasis on writing of* interpretive and critical essays Particular attention to poetry Designed for but not limited to English majors

219 Introduction to Linguistics (Ling 219) (3-0) Cr 3 F S SS *Prereq Sophomore classification* Introduction to linguistic concepts and principles of linguistic analysis with English as the primary source of data Sound and writing systems sentence structure vocabulary and meaning Issues in the study of usage regional and social dialects and language change

220 Applied English Grammar (Ling 220) (3-0) Cr 3 F S *Prereq 105* Principles of English grammar and standard usage terminology concepts rules values and limitations of both traditional grammar and newer approaches Evaluation of some authorities on grammar Identification and analysis of common errors Not a remedial course

230 231 Literature and Culture (3-0) Cr 3 each F S *Prereq Credit in or exemption from 104* Selected literary texts chosen for their attention to important trends values attitudes ideals and beliefs of our own and past times 230 British literature 231 American literature

240 Science Fiction (3-0) Cr 3 F S *Prereq Credit in or exemption from 104* Development of science fiction from its origins in nineteenth century fiction to the present Focus on recent experiments with point of view narration style and the transformation of myths

301 Selected Topics in Popular Culture (3 0) Cr 3 each time taken maximum of 6 F S *Prereq 105* Selected topics in the study of the popular arts and forms of expression Examination of conventions artistry social and historical significance of popular artists and their work

302 Business Communication (3-0) Cr 3 F S SS *Prereq 105 junior classification* Theory principles and processes of effective written communication typically encountered in business and the professions Extensive writing practice in standard letter and memo forms short proposals policy and procedure descriptions job descriptions application letters résumés autobiographical précis performance reviews and evaluations and letters of recommendation

303 Free Lance Writing for Popular Magazines (3-0) Cr 3 S *Prereq 105* Practical workshop in writing nonfiction articles for popular magazines Emphasis on writing market research preparation of manuscripts methods of submission Major goal of the course is production of marketable material

304 Creative Writing—Fiction (3-0) Cr 3 F S *Prereq 105 not open to freshmen* Progresses from practice in basic techniques of fiction writing to fully developed short stories Emphasis on writing analytical reading workshop criticism and individual conferences

305 Creative Writing—Nonfiction (3-0) Cr 3 F S *Prereq 105 not open to freshmen* Workshop in writing imaginative essays both critical and personal Analytical reading development of literary techniques Individual and small group conferences

306 Creative Writing—Poetry (3-0) Cr 3 F S *Prereq 105 not open to freshmen* Progresses from traditional to contemporary forms Emphasis on writing analytical reading workshop criticism and individual conferences

307 Writing and Publishing Young Adult Fiction (3-0) Cr 3 S *Prereq 105 not open to freshmen* Workshop in writing short stories and novels for young adults Emphasis on audience technique and current publication possibilities Individual and small group conferences

309 Report and Proposal Writing (3-0) Cr 3 F S SS *Prereq 105 junior classification* Nature function and types of reports and proposals Analysis of readers methods of research procedures for drafting and revision design of layouts Extensive writing practice with reports and proposals

310 Rhetorical Analysis (3-0) Cr 3 F S *Prereq Credit in or exemption from 105* Fundamental principles of rhetorical study Emphasis on basic rhetorical theory and composing perspectives Particular attention to analysis and practice of expository writing

314 Technical Communication (3 0) Cr 3 F S SS *Prereq 105 junior classification* Theories principles and processes of effective written communication in the technical disciplines Attention to the major strategies for composing technical discourse techniques of analyzing audiences and writing situations and for organizing data and information

315 Creative Writing—Screenplays (3 0) Cr 3 F *Prereq 105 not open to freshmen* Stresses master scene technique of writing fully developed screenplays Emphasis on TV and movie techniques writing workshop criticism analytical reading and viewing and individual conferences

316 Creative Writing—Playwriting (Thtre 316) (3-0) Cr 3 S *Prereq 105 not open to freshmen* Progresses from production of scenes to fully developed one-act plays Emphasis on action staging writing analytical reading workshop criticism and individual conferences

335 Film (3-0) Cr 3 each time taken maximum of 6 F S *Prereq 105* Principles of film art and the traditional vocabulary of literature as applied to film Influence of film on modes of thought and behavior Materials fee

339 Literary Theory and Criticism (3 0) Cr 3 F S *Prereq 210 and 3 additional credits in literature* Study of selected texts of literary criticism with attention to the purposes and practices of criticism

340 Survey of Women s Literature (W S 340) (3 0) Cr 3 F S *Prereq 105* Historical and thematic survey of literature by and about women May include autobiographies journals letters poetry fiction and drama

341 Women Men and the English Language (Ling 341) (W S 341) (3-0) Cr 3 S *Prereq 219 or an introductory course in linguistics* The ways men and women differ in using language in varied settings and the ways in which language both creates and reflects gender divisions Readings and individual projects

345 Women and Literature Selected Topics (W S 345) (3-0) Cr 3 each time taken maximum of 6 S *Prereq 105* Literature by women and/or dealing with the images of women e g study of individual authors or related schools of authors exploration of specific themes or genres in women s literature analysis of recurrent images of women in literature

346 American Indian Literature (Am In 346) (3 0) Cr 3 S *Prereq 105* Survey of literature by the American Indian from pre Columbian tales and songs to contemporary novels and poetry

347 Survey of African American Literature (Af Am 347) (3-0) Cr 3 F *Prereq 105* Literature by African Americans from the beginnings to the 1960s

348 Contemporary African American Literature (Af Am 348) (3-0) Cr 3 S *Prereq 105* Intensive reading in literature by African Americans from 1960 to the present

349 Selected Topics in Minority Literatures (Af Am 349) (3-0) Cr 3 each time taken maximum of 6 S *Prereq 105* Literature by and/or about American ethnic minorities May include literature of several ethnic groups or focus upon one of the following Asian Americans African Americans Hispanic Americans American Indians

350 Rhetorical Theory (3-0) Cr 3 F S *Prereq 310* Major theories of rhetoric and composition from classical antiquity to the present with an emphasis on their applicability to contemporary writing theory

353 Western World Literature Ancient through Renaissance (Cl St 353) (3-0) Cr 3 F *Prereq 105* Representative works from the drama epics poetry and prose of the Ancient World (Greece and Rome) through the Renaissance May include Homer Plato Sophocles Dante Boccaccio Cervantes and others

354 Western World Literature Neo-classical through Modern (3-0) Cr 3 S *Prereq 105* Representative works from European drama fiction poetry and nonfiction from the Neo-classical through the Modern periods

356 Literary Study of the Bible (3-0) Cr 3 F S *Prereq 105* Selected readings from Judaic and Christian sacred literature including narrative poetry wisdom literature and apocalyptic literature

357 Folklore (3-0) Cr 3 F *Prereq 105* Types functions contexts and purposes of folklore Emphasis on traditional narratives and verbal folklore

358 Myth, Fairytale and Legend (3 0) Cr 3 S *Prereq 105* Analysis of traditional oral myths fairytales legends and ritual

360 American Literature Beginnings to 1820 (3-0) Cr 3 F S *Prereq 105* American literature from its beginnings through the colonial period to early romanticism literary works in their social and cultural contexts

361 American Literature 1820 to 1865 (3 0) Cr 3 F S *Prereq 105* American literature through the romantic era literary works in their social and cultural contexts

362 American Literature 1865 to 1914 (3 0) Cr 3 F S *Prereq 105* Realism and naturalism in American literature to the beginning of World War I literary works in their social and cultural contexts

363 American Literature 1914 to 1945 (3 0) Cr 3 F S *Prereq 105* American literature from World War I through World War II literary works in their social and cultural contexts

364 American Literature 1945 to the Present (3-0) Cr 3 F S *Prereq 105* American literature since World War II postmodernism and beyond literary works in their social and cultural contexts

366 Studies in Drama (3 0) Cr 3 each time taken maximum of 6 F *Prereq 105* Selected topics in the study of drama Examination of important themes genres dramatists and periods

367 Modern Drama (3 0) Cr 3 S *Prereq 105* Origins and development of modern theatre readings in the works of American British and Continental dramatists

370 Shakespeare (3-0) Cr 3 F S SS *Prereq 105* Reading and analysis of selected plays Development of Shakespeare s dramatic art in its social and intellectual context

373 British Literature The Middle Ages (3-0) Cr 3 F S *Prereq 105* Medieval literature (*Beowulf* through the fifteenth century) considered in the social and intellectual context of the period

374 British Literature The Renaissance (3-0) Cr 3 S *Prereq 105* Renaissance literature (More to Milton) considered in the social and intellectual context of the period

375 British Literature The Restoration and 18th Century (3 0) Cr 3 F *Prereq 105* Restoration and eighteenth century literature (Dryden to Johnson) considered in the social and intellectual context of the period

376 British Literature The Romantic Period (3-0) Cr 3 F S *Prereq 105* Romantic literature (Blake to Byron) considered in the social and intellectual context of the period

377 British Literature The Victorian Period (3 0) Cr 3 F *Prereq 105* Victorian literature (Carlyle to Hardy) considered in the social and intellectual context of the period

378 British Literature The Modern Period (3-0) Cr 3 S *Prereq 105* Twentieth-century British literature before 1945 (Conrad to Auden) considered in the social and intellectual context of the period

379 British Literature The Contemporary Period (3-0) Cr 3 F S *Prereq 105* British literature from 1945 to the present considered in the social and intellectual context of the period

384 Modern Fiction (3-0) Cr 3 F S *Prereq 105* Works of fiction by American British and Continental writers in the twentieth century Trends techniques intellectual concerns and critical perspectives

389 Contemporary Literature (3-0) Cr 3 each time taken maximum of 6 S *Prereq 105* Studies in fiction poetry or drama of the last two decades Emerging trends and techniques intellectual concerns

393 The History of Children s Literature (3-0) Cr 3 F *Prereq 105* Origin and development of English and American children s literature through the nineteenth century Special emphasis on nature structure and enduring themes of fantasy literature

394 Literature of Adolescence (3 0) Cr 3 F *Prereq 105* Literature for and about the adolescent Critical study and evaluation of the genre examination of modes and themes found in the literature study of the relationship of the genre to literature for children and adults Selection of literature for use in school programs

404 Creative Writing Workshop—Fiction (3 0) Cr 3 each time taken maximum of 6 F S *Prereq 304* Individual projects in creative writing Emphasis on advanced writing techniques workshop criticism and individual conferences

405 Creative Writing Workshop—Nonfiction (3-0) Cr 3 each time taken maximum of 6 F S *Prereq 305* Individual projects in creative writing Emphasis on advanced writing techniques workshop criticism and individual conferences

406 Creative Writing Workshop—Poetry (3-0) Cr 3 each time taken maximum of 6 F S *Prereq 306* Individual projects in creative writing Emphasis on advanced writing techniques workshop criticism and individual conferences

415 Business and Technical Editing (3 0) Cr 3 S *Prereq 105 junior classification* Editing journal articles research reports technical manuals newsletters and proposals Attention to editorial levels and styles project management editor author relationships and electronic editing

416 Graphic Communication in Business and Technical Writing (3 0) Cr 3 F *Prereq 302 309 or 314 and junior classification* Rhetorical aspects of visual communication in business and technical writing Issues in the design of text charts graphs diagrams schematics illustrations and other visual displays Projects drawn from student s discipline

***419 (516 DL) English Syntax** (Ling 419) (3-0) Cr 3 F *Prereq 219 or an introductory course in linguistics junior classification* Theories and methods for analysis of English syntax with emphasis on recent syntactic theory

420 Origins and Development of the English Language (Ling 420) (3-0) Cr 3 *Prereq 219 or equivalent introduction to linguistics junior classification* Historical study of the English language Comparison of English to other languages by family background and by type Analysis of Old Middle and Early Modern English texts Contemporary trends in Modern English

425 Second Language Acquisition (Ling 425) (3 0) Cr 3 S *Prereq 219 or an introductory course in linguistics junior classification* The process of second language acquisition in children and adults The role of the first language the order of acquisition individual learner differences contextual variation and the role of instruction

440 Seminar in British Literature (3-0) Cr 3 F *Prereq 6 credits in literature and junior classification* Selected authors movements eras or genres in British literature Readings in criticism

441 Seminar in American Literature (3-0) Cr 3 S *Prereq 6 credits in literature and junior classification* Selected authors movements eras or genres in American literature Readings in criticism

442 Seminar in World Literature (3-0) Cr 3 S *Prereq 6 credits in literature and junior classification* Selected authors movements eras or genres in world literature Readings in criticism

450 Seminar in Drama (3 0) Cr 3 F *Prereq 6 credits in literature and junior classification* Selected authors movements eras or national literatures Readings in criticism

451 Seminar in Poetry (3 0) Cr 3 S *Prereq 6 credits in literature and junior classification* Selected authors movements eras or national literatures Readings in criticism

452 Seminar in Prose (3-0) Cr 3 Cr 3 F S *Prereq 6 credits in literature and junior classification* Selected authors movements eras or national literatures May include the novel the short story the essay or autobiography Readings in criticism

453 Seminar in Film (3-0) Cr 3 S *Prereq 6 credits in film and/or literature and junior classification* Film history theory genre or authorship Readings in criticism

460 Seminar in Women s and/or Minority Literature (3-0) Cr 3 F *Prereq 6 credits in litertature and junior classification* Selected readings of various authors movements eras or genres Readings in criticism

461 Seminar in Single Figure Study Canon and Context (3-0) Cr 3 F *Prereq 6 credits in literature and junior classification* Single figure (e g Austen Chaucer Milton Morrison Twain or Woolf) studied through literary social critical and historical contexts

462 Seminar in Criticism and Theory (3 0) Cr 3 S *Prereq 6 credits in literature and junior classification* Developments and issues in literary criticism and theory

463 Seminar in Literature and Culture (3-0) Cr 3 F *Prereq 6 credits in literature and junior classification* Interrelationships among literary works social and historical contexts and reception Texts by several authors Readings in criticism

487 Internship in Business Technical, and Professional Writing (3-0) Cr 1 to 3 S *Prereq 302 309 314 415 or 416 and permission of instructor* An opportunity to write edit and design business and technical documents in a professional setting Projects include reports proposals manuals brochures newsletters

489 Undergraduate Seminar (Ling 489) (3-0) Cr 3 each time taken S *Prereq 9 credits in English beyond 105* Intensive study of a selected topic in literature criticism rhetoric writing or language Cross listing with linguistics acceptable only when offered as a course in linguistics

490 Independent Study Cr var F S *Prereq 9 credits in English beyond 105 appropriate to the section taken junior classification permission of Undergraduate Studies Committee No more than 9 credits of Engl 490 may be used toward graduation* Designed to meet the needs of students who wish study in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

A Literature
B Linguistics Semantics (Ling 490B)
C Rhetoric Teaching of Composition
D Criticism and Theory of Literature
E Reading Instructional Methods and Research
F Creative Writing
G Business/Technical Communication
H Honors

493 Composition and Rhetoric for Teachers (3-0) Cr 3 F S *Prereq 219 or 220 310 admission to teacher education program Psych 333* Current theory and practice in the teaching of writing to secondary school students Designing assignments evaluating writing analyzing errors and teaching syntactic and rhetorical skills

494 English in the Secondary Schools (SecEd 494) (3-0) Cr 3 F S *Prereq 493 18 credits in English beyond 105* The nature of language arts and its relationship to student growth goals approaches materials common to language arts study in the secondary schools emphasis on a student-centered approach to teaching English Preparation and evaluation of teaching materials

***495 (518 DL) Teaching English as a Second Language Methods and Materials** (Ling 495) (3 0) Cr 3 F *Prereq 219 or an introductory course in linguistics junior classification* Issues in methods techniques materials curriculum design and evaluation for all levels of ESL Practical applications including group and individual projects

496 Supervised Tutoring (2 6) Cr 1 to 3 F S *Prereq One course in reading composition or English as a second language appropriate to the section taken permission of instructor* Practical experience in evaluating and developing materials for tutorial purposes and in teaching students in a tutorial situation Consultation and meetings with instructor

B Composition
C English as a Second Language

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Proseminar Teaching English Composition (3-0) Cr 3 F S *Required of all new English 104/105 teaching assistants* Introduction to the teaching of English 104/105 Current theories and practices related to 104/105 objectives lesson planning and teaching methods development of writing assignments evaluation of student writing

501 Proseminar Teaching English as a Second Language (1-0) Cr R F *Required of all new teaching assistants of English 101* Support and supervision of teaching assistants of English 101 Discussion of lesson planning teaching methods development of writing assignments and evaluation of student writing

503 Teaching Composition Theory and Research (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in English* Consideration of current theories practices and research methods in the field of composition/rhetoric

504 Teaching Business and Technical Writing (3 0) Cr 3 Alt F offered 1993 *Prereq 302 314 or 493* Theory and practice of teaching college courses in business and technical writing Some consideration of in service writing courses for business and government Emphasis on applicable communication and composition theory curriculum planning assignment design materials development

506 Advanced Communications (3-0) Cr 3 S *Prereq 6 credits in English permission of instructor* Introduction to contemporary theories of communication emphasis on the application of these theories to business and technical writing

507 Professional and Occupational Writing (3 0) Cr 3 F *Prereq 6 credits in English permission of instructor* Introduction to the theory and practice of writing and analyzing documents prepared in business science and industry Guided readings individual projects

509 Writing Proposals and Grant Applications (3 0) Cr 3 F *Prereq 6 credits in English composition* Theories of written communication as applied to persuasive discourse Writing and analysis of proposals or grant applications to businesses governmental agencies and private and corporate foundations

511 Introduction to General Linguistics (Ling 511) (3 0) Cr 3 F *Prereq 3 credits in linguistics* Principles and methods of general linguistics the historical development of languages descriptions of language use

512 Historical and Comparative Study of the English Language (Ling 512) (3-0) Cr 3 S *Prereq 3 credits in linguistics or in British literature before 1600* Relationship of English to other Indo European languages Characteristics of Old Middle Early Modern and Modern English phonological morphological syntactic and semantic change in English development of written English and its conventions historical survey of attitudes toward the English language Comparison of English with other language types language universals

513 Language and the Mind (Ling 513) (3 0) Cr 3 F *Prereq 3 credits in linguistics* Linguistic processes involved in producing and understanding language Language comprehension language acquisition pragmatics and discourse analysis

514 Language in Society (Ling 514) (3 0) Cr 3 S *Prereq 3 credits in linguistics* Theories and methods of examining language in its social setting Analysis of individual characteristics (e g age gender ethnicity social class region) interactional factors (e g situation topic purpose) and national policies affecting language use

515 Phonology (Ling 515) (3-0) Cr 3 S *Prereq 511 or an introductory course in linguistics* Theoretical and practical analysis of the sound systems of languages with an emphasis on English phonology

***516 (419 DL) English Syntax** (Ling 516) (3 0) Cr 3 F *Prereq 3 credits in linguistics* Theories and methods for analysis of English syntax with emphasis on recent syntactic theory

517 Theoretical Foundations for Teaching English as a Second Language (Ling 517) (3 0) Cr 3 S *Prereq 511 or an introductory course in linguistics* Theoretical issues and research in second language acquisition related developments in theoretical linguistics psycholinguistics and language pedagogy (For TESL methods course see 518)

***518 (495 DL) Teaching English as a Second Language Methods and Materials** (Ling 518) (3 0) Cr 3 F *Prereq 3 credits in linguistics* Issues in methods techniques materials curriculum design and evaluation for all levels of ESL instruction Practical applications including group and individual projects

519 Principles of ESL Testing (3 0) Cr 3 F *Prereq 517 518* Principles of second language testing including concepts of reliability validity and practicality Critical examination of various types of tests Interpretation and analysis of test scores Relationship of language testing and applied linguistics

520 Pedagogical Analysis of English (Ling 520) (3-0) Cr 3 S *Prereq 3 credits in linguistics* Identification of the basic rule-governed patterns of English syntax semantics and discourse Analysis of errors produced by learners of English Development of strategies for teaching standard usage especially to non native speakers of English

521 Teaching Literature and the Literature Curriculum (3 0) Cr 3 Alt F offered 1994 *Prereq 9 credits in literature* Examination of the roles of the literary work reader and teacher in literary study Responses to literature Place of literature in language arts Study and development of curriculum materials for varied levels of instruction

522 Literary Criticism (3-0) Cr 3 Alt S offered 1994 *Prereq 9 credits in English* Study of selected texts of literary criticism with attention to the purposes and uses of critical concepts

530 Methods of Literary Scholarship (3-0) Cr 3 Alt F offered 1993 *Prereq 9 credits in English* An introduction to graduate study in English Major emphasis on kinds purposes and methods of research commonly pursued by literary scholars

534 Science and Literary Imagination Rise of Romanticism (3 0) Cr 3 Alt F offered 1994 *Prereq 6 credits in literature* Literature and science of the 17th to early 19th century considered as complementary expressions of basic cultural paradigms Attention to imagery metaphor theories of language

535 Science and Literary Imagination Modernism and Post-modernism (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in literature* Literature and science of the later 19th and 20th centuries considered as complementary expressions of basic cultural paradigms Attention to imagery metaphor theories of literary language

542 Studies in Drama (3 0) Cr 3 Alt S offered 1995 *Prereq 6 credits in literature* Historical thematic formal or theoretical study of drama

545 Studies in Women s Literature (W S 545) (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in literature* Historical thematic formal or theoretical study of women writers

546 Studies in 20th Century Literature (3 0) Cr 3 each time taken maximum of 6 F *Prereq 6 credits in literature* Consideration of two or more authors

547 The History of Rhetorical Theory I From Plato to Bacon (3-0) Cr 3 F *Prereq 6 credits in English permission of instructor* Principles of Classical Medieval and Renaissance rhetoric emphasis on their relation to writing

548 The History of Rhetorical Theory II From Bacon to the Present (3 0) Cr 3 S *Prereq 6 credits in English permission of instructor* Principles of rhetoric from the early modern period (Bacon Descartes and Locke) to the present emphasis on their relation to writing

549 Studies in Minority Literatures (3-0) Cr 3 Alt S offered 1994 *Prereq 6 credits in literature* Historical thematic formal or theoretical study of American ethnic minority authors May include literature of several ethnic groups or focus upon one of the following African Americans Asian Americans Hispanic Americans Native Americans

554 Advanced Imaginative Writing Prose Cr 1 to 3 each time taken maximum of 12 F S *Prereq Submission of acceptable portfolio* Individual projects on a workshop and conference basis

556 Advanced Imaginative Writing Poetry Cr 1 to 3 each time taken maximum of 12 F S *Prereq Submission of acceptable portfolio* Individual projects on a workshop and conference basis

557 Studies in Creative Writing (3 0) Cr 3 S *Prereq 3 credits in graduate creative writing* Ideas issues and techniques in creative writing Subject matter may include specific genres aspects of the creative writing process or themes of particular interest Significant written work required previous workshop experience helpful

558 Teaching Creative Writing (3-0) Cr 3 Alt S offered 1995 *Prereq 3 credits in creative writing* Approaches effective for grade school through adult-education classes Writing exercises workshops text evaluation and visits from creative writers

559 Creative Writing Teaching Internship Cr 1 to 3 Alt S offered 1995 *Prereq Concurrent enrollment in 558 permission of English graduate committee* Students assist in an introductory creative writing class Some supervised teaching but mainly evaluation of submissions and individual conferences Requirements and grades determined by participating instructors

562 Studies in American Thought and Writing (3 0) Cr 3 S *Prereq 6 credits in American literature* Ideas and issues in American writing Subject matter may include biographical philosophical or journalistic writing as well as poetry fiction or drama

563 Studies in American Fiction to 1950 (3-0) Cr 3 Alt F offered 1993 *Prereq 6 credits in American literature* Two or more writers at least one of whom worked before 1900

564 American Transcendentalism (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in American literature* Transcendentalism as a force in American literature with main emphasis on philosophic origins the American scene and the writings of Emerson Thoreau and the minor transcendentalists

566 Studies in American Poetry to 1950 (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in American literature* Two or more authors at least one of whom worked before 1900

570 Studies in Renaissance British Literature (3-0) Cr 3 Alt S offered 1994 *Prereq 6 credits in British literature 374 recommended* Selected writers 1500 1660

571 Studies in Restoration and 18th Century British Literature (3-0) Cr 3 Alt F offered 1993 *Prereq 6 credits in British literature preferably 374 375* Selected writers 1660-1800

574 Chaucer (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in British literature 373 recommended* Intensive study of selected works of Chaucer and Chaucer criticism

576 Studies in 19th Century British Literature (3 0) Cr 3 Alt F offered 1993 *Prereq 6 credits in British literature 376 377 recommended* Selected writers 1800 1900

579 Major British Authors (3-0) Cr 3 Alt S offered 1995 **Prereq 6 credits in British literature** Selected major authors studied singly or in combination

580 Shakespeare (3-0) Cr 3 Alt F offered 1993 *Prereq 6 credits in British literature prior to 1800* Shakespeare as poet and dramatist Chief critical schools and areas of scholarship

582 Studies in British Fiction to 1900 (3 0) Cr 3 Alt S offered 1994 *Prereq 6 credits in British literature* Study of selected novelists

583 Writing Manuals and Instructional Materials (3-0) Cr 3 S *Prereq 6 credits in English composition* Application of rhetorical strategies to analysis and design of professional documents Principles and processes for developing business and technical manuals emphasis on application to computer documentation

584 Editing Principles and Practices I (3-0) Cr 3 F *Prereq 302 314 or 415* Principles of technical editing in business scientific and professional fields Emphasis on policymaking project management and methodology Both group and individual editing projects involving diverse fields audiences and formats

585 Editing Principles and Practices II Advanced Editing and Publication Management (3-0) Cr 3 Alt S offered 1994 *Prereq 415 or 584 507 and 586 (or 314) strongly recommended* Specialized editing of graphics mathematics and statistics technical documents and on line computer documentation Management of publications in business and technical fields

586 Visual Communication in Professional Writing (3-0) Cr 3 F *Prereq 302 314 or 507* Rhetorical theory and research in graphics document design and related principles of visual communication Methods of designing texts charts data displays diagrams illustrations and other visual elements in business and technical communications

587 Internship in Business Technical and Professional Writing (3 0) Cr 1 to 3 each time taken maximum of 6 S *Prereq 507 plus 3 additional graduate credits in business and technical writing or composition and rhetoric and permission of instructor Limited to masters and doctoral degree candidates in English* An opportunity to write edit and design business and technical documents in a professional setting Projects include reports proposals manuals brochures newsletters

588 Supervised Practicum in Teaching English as a Second Language (3 0) Cr 3 F S *Prereq 21 credits toward the TESL master s degree* Observation and supervised practice in teaching students of English as a second language with seminar discussion of these experiences

589 Seminar Cr 3 each time taken maximum of 6 *Prereq 12 credits in literature linguistics or rhetoric (excluding 104 105)*
A Literature (W S 589A**) F
B Teaching English as a Second Language (TESL)/Linguistics (Ling 589B)
C Composition and Rhetoric
E Business and Technical Communication
F Creative Writing

590 Special Topics Cr var *Prereq Permission of the English Graduate Committee according to guidelines available in the department office*
A Literature
B Teaching English as a Second Language (TESL)/Linguistics (Ling 590B)
C Composition and Rhetoric
E Business and Technical Communication
F Creative Writing

593 Workshop Cr arr

599 Creative Component Cr 3

Courses for Graduate Students

601 Research Methods in Rhetoric and Professional Communication (3-0) Cr 3 S *Prereq 6 graduate credits in English* Survey of the major quantitative and qualitative methods used in writing and language research in academic and nonacademic settings

611 Seminar Topics in the History of Rhetorical Theory (3-0) Cr 3 Alt F offered 1993 *Prereq 547 permission of instructor* Rhetorical theory criticism and/or practice in relation to a historical period the historical development of a rhetorical concept or study of one or more figures in the history of rhetoric

621 Seminar Topics in Current Rhetorical Theory (3 0) Cr 3 S *Prereq 503 or 506 permission of instructor* Aspects of modern-day rhetorical theory criticism and practice or study of one or more current figures or rhetorics

631 Organization and Administration of Writing Programs (3 0) Cr 3 Alt S offered 1994 *503 or 504* Survey of the major components of writing instruction in academic and nonacademic settings History theory organization and evaluation of writing programs Guided observation of writing program functions at various institutions and businesses

699 Research

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*See page 119 for information on dual listed courses

Entomology

Thomas C Baker Chair of Department

Professors Baker Coats Dewitt Hart Krafsur L Lewis R Lewis Pedigo Rowley Showers Tollefson Wilson

Emeritus Professors Guthrie Stockdale

Associate Professors Holscher D Lewis Obrycki Rice Wintersteen

Assistant Professors Binder

Undergraduate Study

For undergraduate curriculum in entomology see *College of Agriculture Curricula*

The undergraduate curriculum in entomology is designed for persons interested in studying insects their adaptations and the practicalities of dealing with them Students electing entomology as a major will prepare themselves for positions in industry business government education and public health *Graduates may acquire positions in* research development and technical sales for agricultural chemical companies State and federal agencies employ entomologists as consultants extension directors mosquito abatement agents inspectors and research aides Entomologists may also find employment as consultants with pest-management consulting firms, large private farms and ranches and horticultural nurseries

Students who are planning to enter agricultural occupations dealing with insect control are advised to elect the pest management secondary major Pest management is an undergraduate secondary major that can be taken with entomology in a double-major program A pest management minor is also available (See *Pest Management*) Entomology participates in the interdepartmental undergraduate major in plant health and protection

The department offers a minor in entomology that may be earned by completing 370 376 and 9 credits in courses selected from an approved list supplied by the department

A preveterinary program is available in entomology

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with a major in entomology or toxicology Within the entomology major, the student may concentrate in biological control chemical ecology genetics forest entomology host plant resistance medical/veterinary entomology morphology pathology pest management, physiology population ecology/genetics systematics or insecticide toxicology

Prerequisite to the entomology major and to minor graduate work in the department is completion of at least two years of zoological courses for part of which credit in other closely allied biological sciences may be substituted Specific course requirements for advanced degrees depend partly upon previous training and experience in the major field of specialization

Any student receiving the M S in entomology shall have at least one course in insect morphology one course in insect systematics and a course in either insect ecology or insect physiology Any student receiving the Ph D in entomology shall have *at least one course in each of these areas* Equivalents of these courses taken at other universities will be acceptable Enrollment and participation in at least 2 credits of Ent 500 is required for each graduate degree sought in the department One credit for thesis seminar and one credit for a nonthesis related presentation is required for each degree Teaching experience is strongly encouraged for all Ph D students in entomology and may be required by a student s Program of Study Committee

Entomology participates in the interdepartmental majors in ecology and evolutionary biology and genetics and in the interdepartmental major and minor in toxicology (see *Index*)

The Federal Corn Insects Research Unit and the North Central Plant Introduction Station are available for advanced study in certain phases of entomological research

Open to graduate students for minor credit only 370 374 376

Courses Primarily for Undergraduate Students

110 Technical Lecture (1 0) Cr R F Hart Orientation to areas of and opportunities in entomology

211 Insects and Society (3-0) Cr 3 F Obrycki Biological and ecological aspects of insects The importance of insects in human well being Insect-human interactions Primarily for nonscience majors

370 Insect Biology (2 3) Cr 3 F *Prereq Biol 109 or 201* Hart Structure physiology evolution behavior life histories and recognition of insects Voluntary field trips

***374 (574 DL) Insects and Our Health** (3-0) Cr 3 S *Prereq 3 credits in biological sciences* Rowley Identification biology and significance of insects and arthropods that attack people and animals particularly those that are vectors of disease

***375 (575 DL) Biological Control** (3 0) Cr 3 Alt F offered 1994 *Prereq 370* Obrycki Theory and practice of biological control of insects and weeds ecological basis of biological control biology and ecology of biological control agents and the role of biological control in integrated pest management

***375L (575 DL) Biological Control Laboratory** (0 3) Cr 1 Alt F offered 1994 *Prereq Credit or enrollment in 375* Obrycki Biology and taxonomy of insect predators and parasitoids

376 Fundamentals of Entomology and Pest Management (P M 376 Pl HP 376) (2 3) Cr 3 S *Prereq Biol 109 or 201* Pedigo Introduction to entomology and insect-pest management including life processes ecology economics tactics of population suppression and ecological backlash

416 Forest Pest Management (PL P 416) See *Plant Pathology*

490 Independent Study Cr 1 to 3 each time taken *Prereq 15 credits in biological sciences junior or senior classification permission of instructor A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation*

E Research or work experience

U Laboratory teaching experience For students registering to be undergraduate laboratory assistants

493 Workshop in Entomology Cr 1 to 3 each time taken

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Seminar Cr 1 F S *Prereq Permission of instructor* Reports of research and current literature

550 Pesticides in the Environment (2-0) Cr 2 S *Prereq Graduate classification* Anderson Coats Fate and significance of pesticides in soil water plants and the atmosphere

570 Host Plant Resistance to Insects (2-0) Cr 2 Alt S offered 1994 *Prereq 370 or 376* Tollefson Principles and mechanisms of insect control by host plant resistance

572 Insect Morphology and Evolution (3 3) Cr 4 F *Prereq 15 credits in zoological sciences including 370* Krafsur The functional anatomy and ultrastructure of insects and other arthropods with emphasis on adaptation and evolutionary significance

573 Advanced Insect Pest Management (3 3) Cr 4 Alt F offered 1993 *Prereq 370* Tollefson Contemporary concepts of insect biology and insect population management

***574 (374 DL) Insects and Our Health** (3-0) Cr 3 S *Prereq 9 credits in biological sciences* Rowley Identification biology and significance of insects and other arthropods that attack people and animals particularly those that are vectors of disease

***575 (375 DL) Biological Control** (3 0) Cr 3 Alt F offered 1994 *Prereq 370* Obrycki Theory and practice of biological control of insects and weeds ecological basis of biological control biology and ecology of biological control agents and the role of biological control in integrated pest management

***575L (375 DL) Biological Control Laboratory** (0-3) Cr 1 Alt F offered 1994 *Prereq Credit or enrollment in 575* Obrycki Biology and taxonomy of insect predators and parasitoids

576 Systematic Entomology (3-6) Cr 5 S *Prereq 572* R E Lewis Classification distribution and natural history of insects including fundamentals of nomenclature and taxonomic practice

577 Immature Insects (2-6) Cr 4 Alt F offered 1994 *Prereq 576* R E Lewis Taxonomy distribution and natural history of immature insects including techniques of collection and preservation

590 Special Topics Cr 1 to 3 each time taken Prereq 15 credits in zoological sciences permission of instructor

E Special research topics

T Internship experience in the techniques of organizing and disseminating applied entomological information

U Teaching experience

593 Workshop Cr 1 to 3 each time taken

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*See page 119 for information on dual listed (DL) courses

Courses for Graduate Students, major or minor

610 Insect Genetics (2 3) Cr 3 Alt S offered 1995 *Prereq 370 15 credits in biological sciences and one course in genetics* Krafsur Major genetic systems among the Insects Population genetics principles and methods of genetic manipulation of arthropod populations for economic and public health benefit Review of case histories

655 Insect Physiology (3-6) Cr 5 Alt S offered 1994 *Prereq 370 Zool 355* Life processes of the insects including reviews of current problems in insect physiology

671 Insect Ecology (2 3) Cr 3 S *Prereq 370 Biol 312 Stat 401* Pedigo Concepts of insect population dynamics emphasizing sampling outbreaks analysis and bioeconomics

675 Insecticide Toxicology (Tox 675) (2 3) Cr 3 Alt F offered 1993 *Prereq 655 or Tox 501* Coats Principles of insecticide toxicology classification mode of action metabolism and environmental effects of insecticides

699 Research Cr var

Environmental Studies

(Interdepartmental Undergraduate Program)

Courses in the environmental studies program essentially deal with the relationship between humans and nature or between human and natural systems They are designed to give students an appreciation of the environment and an overview of environmental issues The program is for students pursuing careers related to the environment and for others who simply want to know more about environmental issues Those taking more than one or two environmental studies courses may wish to choose one of the following options

I Major or Program in Environmental Studies A secondary major or a program is available in most colleges Contact the environmental studies coordinator for additional information The program/ secondary major requirements include the following

A Environmental studies core (9 cr) Env S 223 Environmental Science 324 Energy and Air Pollution 425 Environmental Issues

B Environmental studies electives (6 cr) from the following Env S 293 Environmental Planning Env S 380 Natural Resource and Environmental Economics Env S 382, Environmental Sociology Env S 482 Environmental Politics and Policies Env S 491 Environmental Law

C Environmental studies designated courses (15 cr) See environmental studies coordinator for a list of accepted courses The student and coordinator will select from among these courses in planning a coherent program of study

D Environmental studies requires that 18 of these 30 credits be at the 300 level or above The College of Liberal Arts and Sciences has certain additional requirements for more information contact the environmental studies coordinator 201 Bessey Hall

With the approval of the environmental studies faculty certain environmental studies offerings (225 290E 390 415, 421 490E) may be substituted for designated courses However the program must include at least 12 credits of designated courses not in the major department or discipline of the student s primary major The designated courses and their prerequisites may also be used to satisfy general education and sociohumanistic requirements in various colleges and departments Successful completion of the major is recorded on one s transcript

II Minor in Environmental Studies Fifteen credits to include the three core courses (223 324 425) and two other environmental studies courses or environmental studies designated courses (see environmental studies coordinator for list) The student must have an average grade of C or higher in the courses included in the environmental studies minor It may not include courses from the department or discipline of the student s primary major See page 52 for university requirements for the minor For more information, contact the environmental studies coordinator 201 Bessey Hall

Open to graduate students for minor credit only 415 421 425 482 491

Courses Primarily for Undergraduate Students

223 Environmental Science (U St 223) (3 0) Cr 3 S *Prereq Sophomore classification* An introduction to the structure and function of ecosystems and how they are altered by human activity The dynamics of human populations the use of resources by humans and the complex interactions between humans and their environment

225 Environmental Education (U St 225) (2 2) Cr 3 F *Prereq Sophomore classification* Goals issues and instructional materials in environmental education Field experience with teachers and children Information from and experience in nature study outdoor education conservation education and contemporary environmental education Nontechnical case studies of selected environmental and energy issues

290E Special Problems (U St 290E) Cr 1 to 2 F S SS Independent study on topics of an interdisciplinary nature Intended primarily for freshmen and sophomores

293 Environmental Planning (C R P 293) (3-0) Cr 3 F *Prereq Sophomore classification* Comprehensive overview of the field of environmental relationships and the efforts being made to organize control and coordinate environmental aesthetic and cultural characteristics of land air and water Field trip

324 Energy and Air Pollution (U St 324) (3-0) Cr 3 F *Prereq 223* Energy sources (fossil nuclear solar) and the environment Energy conservation Energy policies current and proposed sustainable and nonsustainable Air pollution as a result of energy use Global warming acid precipitation stratospheric ozone depletion their causes and remedies

331 Ecological Living (A Ecl 331) (0-6) Cr 2 Alt F offered 1994 An ecological approach to living on and in harmony with the land with emphasis on self-reliant living Practical information on land ethics wildlife landscaping home food production fish ponds biological farming and alternative energy sources

380 Natural Resource and Environmental Economics (Econ 380) (3 0) Cr 3 F S *Prereq Econ 206* Natural resource availability use conservation and government policy including energy issues Environmental quality and pollution control policies

382 Environmental Sociology (Soc 382) (3-0) Cr 3 F S Environmental quantity and quality as social problems value orientations toward nature environmental quality movement institutional patterns affecting use of natural resources resource management issues

390 Internship in Environmental Studies (U St 390) Cr 1 to 4 Practical experience with nature centers government agencies schools private conservation groups and other organizations Information available from environmental studies coordinator Satisfactory fail grading only

404 Global Climate Change (Mteor 404) (3-0) Cr 3 S *Prereq Four courses in physical or biological sciences or engineering* Biogeochemical cycles ozone chemistry global energy balance structure and circulation of the atmosphere and oceans climate modeling climate variability implications for agriculture water resources energy use and public policy

415 Environmental Studies Seminar (U St 415) (1-0) Cr 1 each time taken F S *Prereq 223* Current or historic topics in environmental studies

421 Field Seminar (U St 421) (0-6) Cr 1 to 2 F S SS Field trips during semester or break to varied sites of environmental interest in or outside of Iowa preceded by readings lectures and examinations about the areas to be visited Focus on development vs preservation Fee

425 Environmental Issues (U St 425) (3-0) Cr 3 S *Prereq 223* Analysis of controversial environmental issues such as world population growth endangered species and habitats wilderness preservation Case studies current and historic national and international Effects of government policy and citizen activism

445 Issues in Sustainable Agriculture (Agron 445) (2 0) Cr 2 F Salvador Synopsis of development of modern agricultural practices and their effect on biological and social environments Emphasis on agricultural science as a human activity by examination of contemporary agricultural issues from agroecological perspective

472 American Environmental History (Hist 472) (3-0) Cr 3 F Evans Evolving history of the North American environment and humans interaction with it from pre European/African settlement through the twentieth century Exploration of comparative cultural attitudes toward nature relationship among science technology and the environment modern conservation and environmental movements and environmental planning and policy making

482 Environmental Politics and Policies (Pol S 482) (3 0) Cr 3 Alt S offered 1994 *Prereq 6 credits in political science* Major ideologies relating to conservation and ecology Primary emphasis on the policy making process in U S national and state governments with principal application to environmental and land use policies Major proposals for improvement in policy content and process

490E Independent Study (U St 490E) Cr 1 to 2 F S SS Independent study on topics of an interdisciplinary nature Intended primarily for juniors and seniors

491 Environmental Law (C R P 491) (3 0) Cr 3 S *Prereq 6 credits in natural science* Legal precedents and alternative policies for environmental protection rights to and regulations for uses of water air and land Federal environmental control acts and leading federal court cases Field trip

Family and Consumer Sciences Education and Studies

Judy K Brun Chair of Department

Professors Brun Cowan Crabtree Fanslow, Smith Williams

Emeritus Professors Anderson Beavers Elliott Hilton Hughes

Associate Professors Amos Torrie

Emeritus Associate Professor Ebert

Assistant Professors Harrison Hausafus Kruempel

Instructors Cameron Fratzke Query Shirer Warning

Undergraduate Study

For undergraduate curricula in family and consumer sciences education and studies leading to the degree bachelor of science see *Family and Consumer Sciences Education* and *Studies in Family and Consumer Sciences*

The department offers work for the bachelor of science degree in two curricula family and consumer sciences education and studies in family and consumer sciences An option in family and consumer sciences education home economics education prepares students for licensure in general home economics vocational consumer and homemaking and in diversified occupational home economics for grades seven through fourteen Under this option an additional subject area specialization in health is encouraged Students may also elect additional coursework leading to certification as a family life educator The other option in family and consumer sciences education educational services in family and consumer sciences is designed for students seeking careers as home economics educators in a variety of settings Students are prepared to apply educational principles to programs in extension business community agencies, community colleges and public school adult education

The option general studies in family and consumer sciences in the curriculum of studies in family and consumer sciences provides students with a broad-based education in family and consumer sciences as preprofessional preparation for careers in areas such as law and medicine International studies in home economics is the other option in studies in family and consumer sciences that prepares students for professional involvement in international programs and activities

Admission to the home economics education or educational services in family and consumer sciences options is initiated in FCEdS 206 and 206L Both options also require a reservation for supervised field experience Students in home economics education also must follow departmental procedures for admission in University Teacher Education For additional teacher education requirements see *College of Education*

The department offers a minor in educational services in family and consumer sciences The minor may be earned by successfully completing 17 credits as follows FCEdS 206 206L 306 306L 415 418 Also available is an FCS studies concentration combined with a major in journalism and mass communication in the College of Liberal Arts and Sciences

Vocational Education Qualifications

The home economics education option is approved by the Iowa Department of Education for the preparation of vocational home economics teachers

English Proficiency Requirement C or better in Engl 104 and 105 plus a student essay evaluated by a departmental committee

Graduate Study

The department offers work for the degrees master of science master of education, and doctor of philosophy with a major in home economics education The M S degree requires a thesis the M Ed degree requires a creative component Minors are available

Programs for advanced degrees with a major in home economics education are individually tailored to fit the educational background experience and professional goals of the student Areas of study provided by the department include program planning curriculum evaluation adult education research methods supervision and administration, international home economics and teacher education Opportunities are available for strengthening one s background in subject matter in other departments in the College of Family and Consumer Sciences

The department cooperates in the following interdepartmental minors housing gerontology and technology and social change The department also cooperates with the departments of Agricultural Education and Studies Industrial Education and Technology and Professional Studies in Education in offering the degree master of education with an area of specialization in vocational education (See *Index*)

Open to graduate students for minor credit only 413 415

Courses Primarily for Undergraduate Students

110 College of Family and Consumer Sciences Orientation (1-0) Cr R F S Orientation to College of Family and Consumer Sciences Iowa State University and the college curricula Acclimation to the university student responsibilities study skills and management of time and energy Development of a long term curriculum plan Offered on a satisfactory fail basis only

206 Introduction to Educational Roles in Home Economics (2 0) Cr 2 F *Prereq Enrollment in 206L* Introduction to the various roles of the home economist in educational settings

206L Laboratory for Introduction to Educational Roles in Home Economics (0 3) Cr 1 F *Prereq Enrollment in 206* Observation participation experiences in educational settings Materials fee

210 College Orientation for Transfer Students (1-0) Cr R F S Half term Orientation to College of Family and Consumer Sciences and Iowa State University general education requirements departments and programs degree planning Leadership opportunities within university environment Offered on a satisfactory fail basis only

260 Foundations of Family and Consumer Sciences (1-0) Cr 1 F S Historical development and philosophical base of home economics Integrative focus for disciplines and areas of specialization

279 Educational Aspects of Family Social Issues (2-0) Cr 2 S *Prereq 2 credits in HD FS* Critical examination of ethical questions technological and social issues affecting families Application to educational settings

290 Special Problems Cr arr F S *Prereq Departmental approval* Independent study on topics of an interdisciplinary nature Intended primarily for freshmen and sophomores

306 Educational Principles for Family Life and Home Economics (2-0) Cr 2 F *Prereq 15 credits in home economics subject matter enrollment in 306L* Use of principles of learning in implementing instructional methods Strategies for use with diverse audiences in formal and nonformal educational settings Can be used toward family life certification

306L Laboratory for Educational Principles for Family Life and Home Economics (0-2) Cr 1 *Prereq Enrollment in 306* Application of methodology to instructional settings Materials fee

310 Career Opportunities (1 0) Cr R F S Half term Survey of current professional opportunities and preparation for the job search process Transition from student to professional role Offered on a satisfactory fail basis only

***314 (514 DL) Microcomputer Applications for Home Economics Education** (1 0) Cr 1 to 2 S Computer applications for use in management and instruction in formal and nonformal educational settings

318 Occupational Home Economics Programs (2-0) Cr 2 S *Prereq 206 and 400 hours work experience in a home economics related job* Impact of vocational legislation Planning and implementing programs in occupational home economics including FHA/HERO Techniques for cooperative education Can be used toward Multi Occupation Cooperative licensure

403 Evaluation for Vocational Home Economics (2-0) Cr 2 S *Prereq Enrollment in 413 and 40 hours of early experience in public schools* Examination of grading policies Construction of test and nontest instruments to measure cognitive affective psychomotor and perceptual learning

413 Curriculum Planning for Family Life and Vocational Home Economics (2-0) Cr 2 S *Prereq 306 306L* Philosophy of vocational education and development of curriculum plans for home economics content in school settings

415 Program Planning and Evaluation for Nontraditional Settings (6-0) Cr 3 S First half term *Prereq 206 306 306L* Concepts for program development needs analysis planning instruction promotion evaluation and reporting Approaches appropriate for various groups Environmental and cultural conditions affecting programs

417 Supervised Teaching in Home Economics Two experiences will be scheduled F *Prereq 413 24 credits in home economics subject matter cumulative grade point of 2 50* Supervised teaching experience Advance reservation required
A Vocational home economics Cr 7
B Home economics Cr 3 to 7

418 Supervised Experiences in a Nontraditional Educational Setting Cr 8 S SS *Prereq 415 24 credits in home economics subject matter* Supervised professional experience in an approved nontraditional educational setting such as extension business community agency or community college Advance reservation required

420 Seminar in Teaching (1-0) Cr 1 F *Prereq Enrollment in 417* Examination of ways to implement in educational settings actions which reflect a personal philosophy of home economics for teaching middle level and high school students

***421 (521 DL) International Perspectives of Family and Consumer Sciences** (3-0) Cr 3 Alt S offered 1995 *Prereq 9 credits in family and consumer sciences* Examination of home economics from an international perspective student participation in application of educational principles to settings in other cultures and adaptation of content to working with families in developing countries

440 Interdepartmental Seminar Cr arr F S Offered on a satisfactory-fail basis only

450 Cooperative Work Study Program Cr arr F S SS Offered on a satisfactory-fail basis only

460 Integrative Approaches in Family and Consumer Sciences (1 0) Cr 1 F S Half term *Prereq 260* Seminar on ways professionals work across disciplines to address contemporary social issues that affect individuals and families Avenues for initiating public policy at the local national and international levels Intended primarily for seniors

490 Independent Study Cr arr *Prereq 6 credits in the College of Family and Consumer Sciences or in the College of Education*
A Adult Education
C Curriculum
D Evaluation
E Extension
G General
H Honors
K Occupational Education
N Human Relations
P Special Needs/Mainstreaming
R Vocational Education

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Short Course Current Home Economics Offerings Cr 1 to 3 F S SS *Prereq 6 credits in education*
A Adult Education
B Supervision and Administration
C Curriculum
D Evaluation
E Teacher Education
F Occupational/Vocational Education
G General
H Research Methodology
I International Education
J Middle Level Education

501 Trends Issues and Public Policy in Home Economics (3-0) Cr 3 F *Prereq 6 credits in education* Discussion of current topics affecting the home economics education profession

507 Program Planning in Home Economics (3-0) Cr 3 F *Prereq Professional experience in a home economics or related area* Application of principles of program development to formal and nonformal educational settings in home economics e g secondary vocational home economics post secondary extension and offerings for special groups Includes integration of methods of evaluation to determine program effectiveness

508 Models for Teaching Family and Consumer Sciences (2-0) Cr 2 Alt F offered 1994 *Prereq 6 credits in education or educational psychology* Selecting teaching strategies and instructional materials in four models of teaching social interaction information processing personal and behavior modification Application to formal and nonformal educational settings with a variety of adult audiences

511 Research Methods (T C 511) (3 0) Cr 3 F *Prereq Graduate classification* An overview of research approaches focusing on testing and generating theory Methods for collecting and analyzing quantitative and qualitative data Development of research proposals

513 Mainframe Computer Applications for Home Economics Education (1-0) Cr 1 F *Prereq Enrollment in 511* Mainframe applications word processing and data analysis

***514 (314 DL) Microcomputer Applications for Home Economics Education** (1-0) Cr 1 to 2 S *Prereq Professional experience in a home economics or related area* Computer applications for use in management and instruction in formal and nonformal educational settings

515 Evaluation in Home Economics (3 0) Cr 3 S *Prereq Introductory statistical skills* Program evaluation models Construction of selected cognitive and affective evaluation devices their use and interpretation in home economics

519 Self-employment Opportunities for Home Economists (2 0) Cr 2 Alt S offered 1994 *Prereq HD FS 283 or Econ 201* Exploration of small business opportunities in home economics Introduction to basic business concepts and analyses of successful businesses

520 Supervision in Home Economics (3-0) Cr 3 Alt S offered 1994 *Prereq Professional experience* Concepts related to supervision Includes study of historical perspective models and current research in supervision Emphasis on conference techniques and change theory

***521 (421 DL) International Perspectives of Family and Consumer Sciences** (3-0) Cr 3 Alt S offered 1995 *Prereq 9 credits in family and consumer sciences* Examination of home economics from an international perspective student participation in application of educational principles to settings in other cultures and adaptation of content to working with families in developing countries

540 Interdepartmental Seminar Cr 1 to 3 F S Offered on a satisfactory fail basis only

590 Special Topics Cr arr *Prereq 6 credits in education or educational psychology*
A Adult Education
B Administration
C Curriculum
D Evaluation
E Teacher Education
F Occupational/Vocational Education
G General
H Research Methodology
I International Education
J Educational Gerontology
K Human Relations
L Special Needs
M Family Life Education
N Human Sexuality
O Computer Applications
P Supervision
Q Family/Individual Health
R Consumer Education

593 Workshop Cr 1 to 3 F S SS *Prereq 6 credits in education* Concentrated group study of problems in field of home economics education Sections offered will vary from year to year

599 Creative Component

Courses for Graduate Students, major or minor

607 Curriculum Theory and Philosophy in Home Economics (3-0) Cr 3 Alt S offered 1995 *Prereq 507 or evidence of curriculum development experience* Integration of philosophies of education and home economics into an operative philosophy of curriculum development Study of various curriculum theories with application to home economics curriculum development

608 Theories of Adult Education in Home Economics (2 0) Cr 2 Alt S offered 1995 *Prereq 508 or experience in adult education* Philosophical issues in adult education Theories of planning learning and teaching home economics appropriate for adults of various age levels and in various settings Incorporates current research

610 Seminar Cr 1 each semester F S Exploration of trends and issues in the profession May be taken more than once for credit Offered on a satisfactory fail basis only

611 Advanced Research Design and Program Evaluation in Home Economics (3-0) Cr 3 Alt F offered 1993 *Prereq 511 515* Proposal and manuscript writing Application of evaluation models to home economics programs

618 Coordination of Educational Programs in Home Economics Cr 2 Alt S offered 1995 *Prereq 520* Approaches to coordination of home economics programs in adult education extension state department of education and teacher education Study of undergraduate programs in home economics education observation and participation in undergraduate courses and practicum experience

620 Theories of Administration in Home Economics (3-0) Cr 3 Alt F offered 1994 *Prereq Graduate work in home economics or higher education* Administration of family and consumer sciences programs in various settings Administrative roles organizational structures planning and budgeting

699 Research

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*See page 119 for information on dual listed courses

Finance

Labh S Hira Chair of Department

Professors Ralston Stover

Emeritus Professor Shadle

Associate Professors Carter Dark Koppenhaver Power Van Auken

Assistant Professors Cowan Singh

Undergraduate Study

For undergraduate curriculum in business major in finance see *College of Business Curricula*

In addition to the basic business requirements finance majors must also complete (1) Fin 352 354 (2) select three from Fin 351 357 358 452 453 454 455 457 499 and (3) select two from Econ 301 304 355 405 455 Acct 383 385 386 387 388 any 400-level accounting course

The courses in finance constitute a broad program of study designed to provide a descriptive behavioral and analytical background of financial management to enable students to qualify for opportunities in banking insurance brokerage government real estate and financial management of business enterprises Finance is also an excellent area for those who wish to become more knowledgeable as consumers particularly in the fields of investments insurance and real estate

Areas of study in the field of finance include financial management investments insurance real estate and banking Upper-level courses include a review of contemporary literature in the field case studies and financial problem analysis integrating finance courses previously taken

Graduate Study

The department participates in two graduate degree programs the M S in business administrative sciences and the M B A full-time day and part-time weekend programs The M S degree in business administrative sciences is a 30-credit curriculum culminating in a thesis The M B A programs are 48-credit nonthesis noncreative component curricula in which the first 24 credits are designed to be completed in a lock step fashion

The department provides work in finance in the Ph D program in economics Inquiries regarding this program can be made at either the Department of Finance or the Department of Economics

Open to graduate students for minor credit only 452 453 454 455 457

Courses Primarily for Undergraduate Students

350 Business Finance (3-0) Cr 3 F S SS *Prereq Acct 285 Econ 201 or 206 Stat 101 or 227 junior classification* Introduction to financial management with emphasis on corporate financial decision making financial statement analysis time value of money asset management valuation of the firm and use of funds

351 Real Estate Principles (3 0) Cr 3 F S SS *Prereq Econ 201 or 206* Legal economic social and financial aspects of real estate including property rights contracts mortgage instruments tax factors brokerage valuation risk and return analysis financing techniques and investments

352 Advanced Business Finance (3-0) Cr 3 F S SS *Prereq 350* Theory used in a firm s investment and financing decisions Analysis of environment in which financial decisions are made applications of analytical techniques to problems involved

354 Principles of Investments (3 0) Cr 3 F S SS *Prereq 350* Introduction to various investment media and markets from the viewpoint of the individual investor Emphasis on financial planning behavior of security markets corporate stocks and bonds individual asset and portfolio selection techniques

357 Insurance Principles (3 0) Cr 3 F S SS *Prereq Econ 201 or 206* Risk concepts and the use of insurance by individuals and families Emphasis on the insurance mechanism and methods of dealing with income property and liability risks

358 Management of Financial Institutions (3-0) Cr 3 F S *Prereq 350* Analysis of operations of banks savings associations and credit unions from management viewpoint Emphasis on organization policy formation asset and liability accounts control of capital funds and regulation

452 International Financial Management (3-0) Cr 3 F S *Prereq 352* Advanced study of contemporary topics and issues in international finance

453 Commercial Loan Management (3 0) Cr 3 F S SS *Prereq 350* Financial managerial and legal issues in commercial lending decisions by financial institutions

454 Financial Futures and Options (3 0) Cr 3 F S SS *Prereq 354* Advanced study of the pricing and use of derivative market instruments current topics and issues

455 Corporate Risk and Insurance Financing (3-0) Cr 3 F *Prereq 357* Analysis of an organizations s approaches to risk transfer loss financing and risk management Emphasis on commercial and group insurance coverages self-insurance and alternative financing arrangements including captive insurers

457 Management of Insurance Companies (3-0) Cr 3 F S SS *Prereq 357* Functional analysis of insurance company operations from a management perspective Emphasis on organization policy formation regulation financial statements solvency requirements and new product planning

490 Independent Study Cr 1 to 3 each time taken *Prereq 350 senior classification permission of instructor*

499 Finance Internship (3 0) Cr 3 F S SS *Prereq 358 or 453 for 499A 357 for 499B junior or senior classification GPA 2 5 permission of internship coordinator* Supervised experience in a private sector banking or insurance organization or in a governmental agency that regulates such organizations No more than 3 credits may be counted toward graduation

A Banking
B Insurance

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

550 Financial Management (3-0) Cr 3 S *Prereq Acct 285 Econ 201 or 206* Financial management problems relationship of finance with other functions within the firm including practical and theoretical methods of financial analysis as part of a system of management decisions

552 Advanced Financial Management (3-0) Cr 3 S *Prereq 550* Modern theory of corporate finance and its application to financial management problems Advanced treatment of firm s investment financing and dividend decisions and survey of related research The investment banking process convertible securities and warrants asset leasing mergers and divestitures leveraged buyouts international financial management executive compensation and pension fund strategy

554 Investments (3-0) Cr 3 F *Prereq 550* A comprehensive survey of the classical and contemporary theories of optimum portfolio construction determinants of risk-return trade off in selection of securities emphasis on the theory and evidence of efficient capital markets and implications for security selection and portfolio management

556 Corporate Financial Policy (3-0) Cr 3 F S *Prereq 550* A financial policy course including financial decision making Cases are emphasized Financial forecasting working capital management and capital structure decisions

590 Special Topics Cr 1 to 3 each time taken F S SS *Prereq Permission of instructor* For students wishing to do individual research in a particular area of finance

Food Science and Human Nutrition

Wayne R Bidlack Chair of Department

Professors Bidlack Glatz Hammond Johnson Kaplan LaGrange Murphy D Olson J Olson Parrish Robson Rust Sebranek Serfass Stromer Swan Topel P White Wilson

Emeritus Professors Dupont Eppright Garcia Hartman Kraft McMillan Nielsen Osman Roderuck Runyan Walker

Associate Professors Bohnenkamp Dickson Ford Hurburgh Jane Lewis J Love M Love Madden McComber Oakland Prusa Reitmeier Schafer Terry

Assistant Professors Cook Hendrich Hintz Hogan Murano Myers Nikolau Nikolov Pometto Redlinger W White Wurtele

Instructors Bassler Benson Speer

The Department of Food Science and Human Nutrition is jointly administered by the College of Agriculture and the College of Family and Consumer Sciences All curricula offered by the department are available to students in either college These curricula include dietetics food science and nutritional science

Undergraduate Study

The dietetics programs include study in basic science and nutrition with applications to medical dietetics and community nutrition *Foodservice management is also an* important aspect of the programs Graduates work in hospitals clinics long-term care facilities food and pharmaceutical industries and government nutrition programs some are private nutrition consultants

There are three options in the dietetics curriculum The coordinated undergraduate program option is accredited by the American Dietetic Association (ADA) and meets both the academic and experience requirements for eligibility for registration by the Commission on Dietetic Registration The dietetics and specialized study option offers opportunities for combining dietetics with exercise science or international studies Both the dietetics portion of this option and the general dietetics option are approved by the ADA and meet the academic requirements for admission to accredited dietetic internships and approved preprofessional practice programs

Food science is a discipline in which the principles of biological and physical sciences are used to study the nature of foods the causes of their deterioration and the principles underlying the processing and preparation of food It is the application of science and technology to the provision of a safe wholesome and nutritious food supply Biotechnology and toxicology interrelate with food science in the area of food safety In the food industry food scientists work in research and development of products or processes production supervision quality control marketing and sales test kitchens and recipe development product promotion and communication Food scientists also serve in government regulatory agencies and academic institutions

Three options are available in food science food science and technology food science and industry and consumer food science The food science and technology option is approved by the Institute of Food Technologists the national professional organization of food science Students interested in quality control/assurance production supervision management and sales or research careers in the food industry government or academia should elect either the food science and technology or the food science and industry option Students who wish to go to graduate or professional school or who are biotechnology scholars in the College of Agriculture should elect food science and technology Students who wish to emphasize business concepts should elect food science and industry *Students interested in test kitchen positions* food product formulation and recipe development food promotion and consumer services in government and industry should elect the consumer food science option Preveterinary preparation is available through the food science and technology option

Students who wish to combine education in engineering with food science may elect the food engineering option in the agricultural engineering curriculum or may arrange special five-year programs

Nutritional science offers students a strong basic science and general education which enables them to gain the knowledge and skills necessary to work in research laboratories of colleges and universities government agencies industries and foundations The curriculum can serve as a preprofessional program for medicine dentistry veterinary medicine or for graduate study in nutrition or other biological sciences

See also the B S /M S program under *Graduate Study*

The department offers minors in food science and in nutrition

A food science and human nutrition area of concentration can be combined with a major in journalism and mass communication in the College of Liberal Arts and Sciences See department for details

English proficiency is certified by a grade of C or better in 6 credits of coursework in composition (Engl 104 and 105 or other communication-intensive course) and a grade of C or better in 3 credits of coursework in oral communication

Postbaccalaureate Program

The approved preprofessional practice program (AP4) is a postbaccalaureate program approved by the American Dietetic Association For more information, refer to *Special Interest Programs* listed under the *College of Family and Consumer Sciences* or contact the department There is a nonrefundable application fee of $15 and a program fee of $75 payable upon acceptance into the program

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in food science and technology and in nutrition and minor work for students taking major work in other departments Graduate work in meat science is offered as a co-major in animal science and food science and technology

Prerequisite to major work is a baccalaureate degree in food science nutrition or other physical or biological sciences or engineering that is substantially equivalent to those at Iowa State University

Students taking major work for the degree doctor of philosophy either in food science and technology or in nutrition may choose minors from other fields including anthropology chemistry biochemistry economics education journalism microbiology psychology physiology sociology statistics toxicology or other related fields

Faculty in the department participate in the major in microbiology the interdepartmental majors in genetics MCDB (molecular cellular and developmental biology) and toxicology and the interdepartmental minor in gerontology

The department offers a B S /M S program that allows students to obtain both the B S and M S degrees in 5 years The program is available to students in the food science and technology option or the nutritional science curriculum Students interested in this program should contact the department for details Application for admission to the Graduate College should be made near the end of the junior year Students begin research for the M S thesis during the summer after their junior year and are eligible for research assistantships

Open to graduate students for minor credit only 311 360 372 403 405 410 411 412 419 420 421 451 461 463 471, 472

Courses Primarily for Undergraduate Students

101 Food and the Consumer (3 0) Cr 3 F S The food system from point of harvest to the consumption of the food by the consumer Properties of food constituents Protection of food against deterioration and microbial contamination Introduction of foods into the marketplace Processes for making various foods Government regulations Use of food additives Current and controversial topics

110 Orientation (1 0) Cr R F Orientation to the department to Iowa State University and to careers in food science nutrition and dietetics Curriculum and career planning

167 Human Nutrition (3 0) Cr 3 F S SS *Prereq Biol 109 or 201 or 202 or Zool 155* Understanding and implementing present day knowledge of nutrition The use of food for health and satisfaction of the individual and the family

202 Food Quality Evaluation (2-3) Cr 3 S Effect of processing on food quality Federal regulations pertaining to the safety and quality of raw and processed foods Emphasis on Food and Drug Administration (FDA) and U S Department of Agriculture (USDA) standards and quality grading of foods Food quality evaluated using official (government and industry) instrumental chemical and sensory procedures

203 Home Economics and Agricultural Systems in Contemporary Societies (1-0) Cr 1 F Major home economics and agricultural problems and their relatedness Impact of economic political social technological and belief systems Emphasis on population public policy food production food and water availability and safety nutrition problems

†211 Fundamentals of Food Preparation (2-3) Cr 3 F S *Prereq 167 Chem 163 163L* Principles involved in preparation of food products of standard quality Influence of composition and techniques on properties of food products Standard methods of food preparation with emphasis on quality nutrient retention and safety Materials fee

†214 Scientific Study of Food (3-6) Cr 5 F S *Prereq Chem 231 or 331* Composition and structure of foods Principles and practice of preparation of standard quality food products Behavior and interactions of food constituents Materials fee

228 Exercise and Nutrition for Lifetime Wellness (P E 228) (3-0) Cr 3 F S Principles of exercise and nutrition which provide a basis of information for life long wellness Open to non majors only

260 Nutrition in Growth and Development (3-0) Cr 3 F S *Prereq 167 Chem 231 or 331 Zool 155* Nutrition throughout the human life cycle Interrelationships of nutrition and biological growth and development

273 Processing of Dairy Products (2-3) Cr 3 S *Prereq Biol 109 or 201 or 202 Chem 163* Composition of dairy products Procedures used in manufacturing distributing and controlling the quality of various dairy products Field trip fee

304 Sensory and Physical Analysis of Food (2 3) Cr 3 Alt S offered 1995 *Prereq 202 or 214 Stat 101 or 104* Introduction to sensory perception and the methods used for studying the sensory qualities of food Analysis and interpretation of data from sensory tests Instrumental methods for measuring physical properties related to sensory response Materials fee

311 Food Chemistry (2 3) Cr 3 F *Prereq Chem 231 and 232 or 331 and 333A a course in biochemistry recommended* The structure properties and reactions of food constituents and commodities

340 Introduction to Dietetics (0-2) Cr 1 F *Prereq Admission to the coordinated undergraduate program in dietetics* Roles of dietitians professional ethics health care delivery systems Offered on satisfactory/fail basis only

360 Nutrition and Dietetics (3-0) Cr 3 F S *Prereq 3 credits in biochemistry 3 credits in physiology recommended* Physiological and chemical bases for nutrient needs Factors to consider in satisfying those needs for individuals and populations

360L Nutrition and Dietetics Laboratory (1 3) Cr 2 F S *Prereq Credit or enrollment in 360* Laboratory experiences in dietary analysis metabolic balance and nutritional status assessment

372 Processing of Fruits and Vegetables (2 3) Cr 3 Alt F offered 1994 *Prereq 202 or Hort 422 or 461 or 471* Harvesting handling processing and storage of fruits and vegetables Current practices and problems Color flavor texture composition nutritional value and safety of raw and processed fruits and vegetables Field trip fee

403 Food Laws Regulations and the Regulatory Process (2 0) Cr 2 F *Prereq Previous coursework in food science at 200 level or above* History of the development of the current federal and state food regulations Guidelines that govern the practice of regulating the wholesomeness of red meats poultry and eggs Presentations by state and federal food regulators

405 Food Quality Assurance (2-2) Cr 3 S *Prereq 202 Stat 101 or 104* Basis of food quality control/assurance programs and establishment of decision making processes Statistical process and quality control procedures (charts and sampling) and their applications to various food systems Development of hazard analysis specifications grades and standards Field trip fee

410 Food Analysis (2 6) Cr 4 S *Prereq 311 or B B 311* An introduction to the theory and application of physical and chemical methods for determining the constituents of food Modern separation and instrumental analysis

411 Experimental Study of Food (2 3) Cr 3 F *Prereq 214 or 311 a course in biochemistry* Experimental approach to the study of factors influencing behavior of foods Materials fee

412 Food Product Development (2-6) Cr 4 S *Prereq 214 411 credit or enrollment in 304* Continued experimental approach to the study of factors influencing behavior of foods Guided individual experience in planning executing and reporting a problem in food research Interpretation and evaluation of pertinent literature Materials fee

416 Family Food Patterns in Selected Cultures (2-3) Cr 3 S *Prereq 211 or 214 311 or 411 permission of instructor* Study and preparation of multicultural family foods and beverages Materials fee

419 Foodborne Hazards (MIPM 419 Tox 419) (3-0) Cr 3 Alt F offered 1994 *Prereq MIPM 202 a course in biochemistry* Pathogenesis of human microbiological foodborne infections and intoxications principles of toxicology major classes of toxicants in the food supply governmental regulation of foodborne hazards

420 Food Microbiology (MIPM 420) See *Microbiology Immunology and Preventive Medicine*

421 Food Microbiology Laboratory (MIPM 421) (1-6) Cr 3 F *Prereq MIPM 202 202L* Standard microbiological techniques employed in the food industry including microscopic examination of foods plate counts other enumeration methods indicator organisms of food quality and safety foodborne pathogens and molds

440 Experience in Clinical Dietetics (0 6) Cr 2 S *Prereq Enrollment in 461 admission to the coordinated undergraduate program in dietetics* Supervised experience in clinical dietetics Includes needs assessment nutrition care plan development documentation counseling and teaching Coordinated with 461

441 Hospital Food and Nutrition Services (1 9) Cr 4 F S SS *Prereq 440 and concurrent enrollment in 442 or admission to approved preprofessional practice program* * Supervised participation in and analysis of food production delivery and other functions related to hospital food and nutrition services Field trip fee

442 Medical Dietetics I (3 15) Cr 8 F S SS *Prereq Concurrent enrollment in 441 or admission to approved preprofessional practice program* * Biological basis of medical drug and diet therapy for selected pathologies Consideration of factors in planning and conducting nutritional care of patients Integration of principles with clinical experience

443 Medical Dietetics II (0 9) Cr 3 F S SS *Prereq Concurrent enrollment in 441 442 or admission to approved preprofessional practice program* *Supervised clinical experience in assessing implementing monitoring and evaluating nutritional care of patients in specialized clinical settings

445 Experience in Community Dietetics (0-6) Cr 2 F S *Prereq Enrollment in 463 and admission to the coordinated undergraduate program in dietetics or admission to approved preprofessional practice program* * Supervised experience in planning and providing nutritional care for individuals and groups in a variety of community settings

451 Unit Operations in Food Processing (3 3) Cr 4 F *Prereq A course in calculus Phys 106 or 111 and 112* Introduction to material and energy balances Fluid flow and thermal properties of food materials Theory and application of momentum and heat transfer Experiments cover basic food engineering measurements material and energy balances momentum transport and heat transfer operations

461 Nutrition in Disease (3-0 or 4-0) Cr 3 or 4 S *Prereq 360 3 credits in physiology* Pathophysiology of selected medical problems with specific attention to nutritional needs and treatment as part of medical therapy

463 Community Nutrition (2 3) Cr 3 F *Prereq 360 3 credits in physiology* Survey of current public health nutrition problems among nutritionally vulnerable individuals and groups Discussion of the multidimensional nature of those problems and of community programs designed to help solve them The role of community nutritionists

466 Nutrition Education Methods (2 2) Cr 3 F *Prereq Credit or enrollment in 360 Sp Cm 212* Nutrition education for groups and individuals in clinical and community settings Includes discussion and experience in applying learning theory assessing educational needs stating goals and objectives selecting learning activities implementing and evaluating instruction and documenting care provided

471 Food Processing (3-0) Cr 3 F *Prereq 101 or 202 or 214 MIPM 202* Food preservation including packaging fermentation irradiation canning freezing dehydration additives Sanitation and plant design Applications to food products

472 Food Processing Laboratory (1 3) Cr 2 F *Prereq Credit or enrollment in 471* Thermal processing low temperature preservation packaging methods food fermentations dehydration processing Field trip fee

480 Professional Seminar in Food Science and Human Nutrition (1-0) Cr 1 F S *Prereq Senior classification in the department* Exploration of current research and issues relevant to professionals in food science and human nutrition

490 Independent Study Cr arr F S SS Prereq Permission of instructor A maximum of 6 credits of 490 may be used toward graduation Independent work in food science nutrition or dietetics
A Dietetics
B Food Science
C Nutrition
H Honors

491 Supervised Work Experience Cr arr F S SS Prereq Advance approval of instructor adviser and departmental executive officer A maximum of 3 credits of 491 may be used toward graduation Supervised off campus work experience relevant to the academic major Offered on a satisfactory fail basis only
A Dietetics
B Food Science
C Nutrition
D Community Dietetics

499 Undergraduate Research Cr arr F S SS *Prereq Permission of staff member with whom student proposes to work A maximum of 6 credits of 499 may be used toward graduation* Research under staff guidance

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†Credit not allowed for both 211 and 214

*Offered on a satisfactory fail basis only for students enrolled in the approved preprofessional practice program

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Short Course Cr arr F S SS *Prereq Permission of instructor*
A Nutrition
B Food Science

501 Advanced Food Science (3-0) Cr 3 S *Prereq 3 credits each in organic chemistry physics mathematics and microbiology* Key principles and applications in the microbiology chemistry and processing of food

510 Food Enzymology (2 3) Cr 3 Alt F offered 1994 *Prereq 311 or 411 or 501 or B B 404* Properties of enzymes important in food processing and production Experimental determination and quantitative evaluation of the influence of concentration of substrates enzyme and inhibitors pH and temperature Specificity and mechanisms important to food and agricultural biochemistry

519 Food Toxicology (Tox 519) (3 0) Cr 3 Alt F offered 1993 *Prereq A course in biochemistry* Basic principles of toxicology Toxicants in the food supply modes of action toxicant defense systems toxicant/nutrient interactions risk assessment

547 Biological Applications of Microscopy (An S 547) See *Animal Science*

553 Advanced Food Processing (3 0) Cr 3 Alt S offered 1994 *Prereq Two semesters in physics a course in physical chemistry recommended* Physical properties of foods and description of food materials from a process engineering point of view Physical principles involved in food processing operations Examples of interrelationships of food properties and process design

560 Advanced Nutrition (5 0) Cr 5 F *Prereq B B 404 and 405 or 420* Principles of the science of nutrition Energy carbohydrates lipids proteins minerals vitamins nutritional interactions metabolic consequences of nutritional manipulation

563 Applied Nutrition Problems (3-0) Cr 3 F *Prereq 360 3 credits in physiology* Emphasis on nutrition problems including obesity and nutrition-related diseases Nutritional epidemiology Nutritional assessment and intervention Food and nutrition policies and programs

565 Malnutrition in Developing Countries (2-0) Cr 2 S *Prereq 360 or An S 318 3 credits in physiology* Identification and quantitative assessment of malnutrition in developing countries Social political economic and geographic ecology of malnutrition and its impact on health Protein energy malnutrition Vitamin and mineral deficiencies Intervention organizations programs and efforts

575 Processed Foods (3-0) Cr 3 F *Prereq 214 or 311 a course in nutrition* Survey of the effects of home and commercial food preparation and processing on the nutrients in food

581 Seminar (1-0) Cr 1 S Training seminar for new students in oral presentation of scientific data Offered satisfactory/fail

590 Special Topics Cr arr F S SS *Prereq Permission of instructor*
A Nutrition
B Food Science
C Teaching

593 Workshop Cr arr F S SS *Prereq Permission of instructor*

Courses for Graduate Students, major or minor

611 Sensory Properties of Foods (2-3) Cr 3 Alt F offered 1994 *Prereq 311 or 411 or 501 or B B 404* Instrumental measurement of the color texture and consistency of foods Isolation and identification of flavors Application of sensory methods to measure the color flavor and texture of foods

612 Food Lipids (3-0) Cr 3 Alt S offered 1994 *Prereq 311 or 411 or 501 or B B 404* Structure and analysis of food lipids glyceride structure crystal form and texture autoxidation refining and processing of fats and oils food applications of fats and oils

613 Food Proteins (3 0) Cr 3 Alt F offered 1993 *Prereq 311 or 411 or 501 or B B 404* Properties of proteins found in milk eggs meat legumes and cereal grains Effect of processing on food proteins

614 Carbohydrates in Foods (3-0) Cr 3 Alt S offered 1995 *Prereq 311 or 411 or 501 or B B 404* Study of production of carbohydrates used in foods changes they undergo during processing and storage of food and relation of their functions to their chemical and physical properties

626 Advanced Food Microbiology (MIPM 626 Tox 626) (2 2) Cr 3 Alt S offered 1994 *Prereq 420 or 421 or 501* Topics of current interest in food microbiology including new foodborne pathogens rapid identification methods effect of food properties and preservation techniques on microbial growth genetic engineering fermentation and biotechnology

661 Human Nutrition and Abnormal Metabolism (3-0) Cr 3 Alt S offered 1995 *Prereq 560 Zool 551 or 552* Advanced study of human metabolism in disease and appropriate nutritional interventions

665 Selected Topics in Nutrition (2-0) Cr 2 each time taken F S *Prereq 560 3 credits in physiology* Series of one-term courses on such topics as proteins vitamins minerals lipids energy metabolism evaluation of nutritional status Classical and current research literature in each area

680 Modern Views of Nutrition (An S 680) See *Animal Science*

681 Seminar (1-0) Cr 1 F S SS Presentation of thesis or dissertation research May be taken once for M S program and twice for the Ph D program

690 Special Problems Cr var F S SS *Prereq 501 or 560*

699 Research Cr var F S SS
A Nutrition
B Food Science

Foreign Languages and Literatures

James R Dow Chair of Department

Professors Bernard Courteau Dow Judith Lacasa Morris

Emeritus Professors Bruner Frink

Associate Professors Dial Henry Jaime Lacasa Nabrotzky Rectanus Roochnik Ruebel Thogmartin Valdes

Emeritus Associate Professor Michelsons

Assistant Professors Chatfield Guerin Johnson Lathers Leonard Mariner Matibag Prince Seabrook Van Iten Whitcomb

Instructors Hutter Kramer Peterson Rosenbusch Tipton

Undergraduate Study

Foreign language study should be a part of the program of most students The theoretical understanding of and practical experience in language underlie many intellectual disciplines that try to meet the complex problems of contemporary society Courses offered by the Department of Foreign Languages and Literatures are designed to offer students an understanding of a second culture through the language spoken by that culture as well as a sound and thorough knowledge of the fundamentals of the language itself Many students also find that second language competence increases employment opportunities In addition to an opportunity to acquire a basic ability to communicate in a language other than one s own the study of a foreign language ranging from an introductory sequence through a minor concentration to a major emphasis provides a rigorous humanistic program of study in support of many disciplines at Iowa State University

The department offers both majors and minors in French German Russian and Spanish leading to the bachelor of arts degree minors in Latin and Portuguese and instruction in Chinese Italian and Classical Greek A minor in any foreign language requires at least 3 courses (9 cr) at the 300 level or higher one (3 cr) of which must be in literature or civilization Courses numbered in the 370s may not be used toward the minor or major A full statement of requirements for the major in each language may be obtained from the department For a complete statement of all the college degree requirements see *Liberal Arts and Sciences Curriculum*

Students who have had formal training in foreign languages offered at Iowa State may obtain credit by passing appropriate examinations Students with native fluency* in languages taught at Iowa State may not enroll in or test out of elementary or intermediate courses (100 and 200 level) in their native language Students with native fluency may be eligible to enroll in literature and civilization courses in their native language at the 300 level or above or receive credit for such courses by passing an appropriate examination such students must also consult the college office to determine eligibility for advanced composition and conversation courses (300 level and above) All students must consult with the department to determine eligibility for enrolling in upper division courses

Students who have completed three or more years of French German, or Spanish in high school may not receive graded credit for 101-102 in those languages test-out credit (T-credit) may be obtained by passing an appropriate examination or by completing an advanced sequence (200-level or higher) in that language If these students choose to take 101-102 on a remedial basis they will be graded S-F

Credit by examination (test-out exams) in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the department is not normally available

The Department of Foreign Languages and Literatures participates in the Iowa Board of Regents foreign language summer programs in Austria France and Spain Information concerning these programs can be obtained directly from the department The department also houses the classical studies program

Language and literature courses numbered 300 and above are principally taught in the target language courses numbered in the 370s are taught in English Courses numbered 110 and 160 are essentially equivalent to 101 and 102 combined credit toward graduation may not be acquired in more than one of these options

Students at all levels of foreign language study will have access to the Language Learning Resource Center located in 312 Pearson The resource center contains an extensive collection of foreign language materials including films music books computer software and hardware and course-related materials

English proficiency requirement The department requires a grade of C– or better in Engl 104 and 105 (or 105H) and a grade of B– or better in any course taught by the Department of Foreign Languages and Literatures or the interdepartmental program in classical studies numbered 370 through 379

Courses open for minor graduate credit Chin 490 F Lng 491 492 Frnch 401 440 441 442 480 490 493 Ger 401 440 471 472 480 490 493 Greek 490 Ital 490 Latin 441 442 490 Port 440, 490 Rus 401 402 441 442 490 Span 330 331 332 401 403 441 442 443, 444 445 480 490 493 494 496

*You have native fluency if your ethnic mother tongue (as indicated on your matriculation card) is the language in which you wish to enroll You are also considered to have native fluency if you have had substantial attendance at a secondary school or university where the language of instruction is the language in which you wish to enroll at ISU

Courses Primarily for Undergraduate Students

Chinese (Chin)

***101 102 Elementary Mandarin Chinese** (5-1) Cr 5 each 101 F 102 S *Prereq 102 101* Introduction to written and spoken Mandarin Chinese Use of the *Hanyu pinyin* phonetic system basic grammatical forms and ability to carry on a simple conversation 101 Acquisition of basic skills recognition of radicals learning to use a dictionary familiarity with alternative phonetic systems 102 Builds oral communication skills expands the character vocabulary for both formal and simplified characters Materials fee

***201 202 Intermediate Chinese** (5 1) Cr 5 each 201 F 202 S *Prereq 201 102 202 201* Review of grammar vocabulary building oral and written skills daily reading practice including substantial readings supplementary to the textbook Emphasis on conversational skills Materials fee

370 Topics in Chinese Literature (3-0) Cr 3 F | Chinese literature in translation A general survey of representative works of major genres in traditional and modern China including works from 600 B C to post Tiananmen Lectures assigned readings and discussions in English

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Chinese and permission of department chair* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

French (Frnch)

Majors in French are required to complete a minimum of 31 credits beyond the intermediate (201 202) level The program has three areas of concentration literature language/pedagogy and interdisciplinary For specific requirements consult with the department

***101 102 Elementary French** (4 1) Cr 4 each 101 F 102 S *Prereq 102 101* Beginning level development of reading writing listening comprehension and speaking in French within the context of French culture Use of the language laboratory Materials fee

110 Intensive Elementary French Cr 8 SS Equivalent to 101 102 combined offered summer only Materials fee

160 Accelerated Beginning French (8 2) Cr 8 S *Prereq 2 3 years experience in another foreign language* Rapid introduction to written and spoken French within the context of French culture accelerated approach to grammar and syntax Intended for students with proven ability to learn language rapidly Materials fee

***201 202 Intermediate French** (3 0) Cr 3 each 201 F 202 S *Prereq 201 102 110 or 160 202 201* Intermediate level development of reading writing listening comprehension and speaking in French within the context of French culture Readings and discussions of a wide range of areas history politics and literature Materials fee

205, 206 Intermediate Conversation (2-0) Cr 2 each 205 F 206 S *Prereq Credit or enrollment in 201 or 202* Practice in basic oral communication skills within the context of French culture Materials fee

301 302 Composition and Grammar Review (3 0) Cr 3 each 301 F 302 S *Prereq 301 202 302 301* Grammar review compositions critical essays and close reading of literary and nonliterary texts Materials fee

305, 306 Advanced Conversation (2 0) Cr 2 each 305 F 306 S *Prereq 305 Credit or enrollment in 301 306 301 305 recommended* Practical use of everyday French Oral presentations Materials fee

321 322 French Civilization (3 0) Cr 3 each 321 F 322 S *Prereq 202 205 301 302 recommended* Readings from the Middle Ages to the present 321 From the Middle Ages to the French Revolution 322 From the French Revolution to the present Materials fee

331, 332 Survey of French Literature (3-0) Cr 3 each 331 F 332 S *Prereq 202 301 302 recommended* French literature from its beginnings to the present Introduction to textual analysis 331 From the Middle Ages to the French Revolution 332 From the French Revolution to the present Materials fee

370 French Studies in English (3-0) Cr 3 Topics vary according to student and faculty interest Author genre or period study such as Medieval romance Francophone literature feminism cinema or contemporary theory Readings discussions and papers in English Can be repeated up to 6 credits Materials fee

375 Contemporary France (3-0) Cr 3 F Readings discussions and papers in English on contemporary thought politics history

anthropology arts etc Of special interest to international studies majors double majors Materials fee

395 Study Abroad Cr 1 to 10 *Prereq 2 years university level French* Supervised instruction in language and culture of France formal class instruction at level appropriate to student s training augmented by practical living experience

401 Writing French (3-0) Cr 3 F *Prereq 302* Practice in various kinds of writing in French including letters narrations *explications de texte* and expository persuasive and analytical texts Review of selected topics in grammar

440 Topics in French Studies (3-0) Cr 3 *Prereq 332* Studies in areas of special interest such as French or Francophone literature feminism or cinema May be repeated up to a maximum of 6 credits

441 Topics in Medieval 16th or 17th Century Literature (3 0) Cr 3 *Prereq 331* Studies in periods genres or individual authors May be repeated up to a maximum of 6 credits

442 Topics in 18th 19th, or 20th Century Literature (3 0) Cr 3 *Prereq 332* Studies in periods genres or individual authors May be repeated up to a maximum of 6 credits

480 Seminar in French Literature (3 0) Cr 3 *Prereq 331 or 332* Study of a selected topic in literature or literary criticism

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in French and permission of department chair No more than 9 credits in Frnch 490 may be counted toward graduation* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

493 Workshop in Second Language Teaching (French) (1 3) Cr 1 to 3 SS *Prereq Experience in teaching French* Professional level skills improvement in spoken and written French Current trends in teaching French language and culture

German (Ger)

Majors in German are required to complete 32 credits beyond the intermediate (201 202) level

***101 102 Elementary German** (4 1) Cr 4 each 101 F 102 S *Prereq 102 101* Introduction to German language within the context of German culture practice in the basic skills Materials fee

110 Intensive Elementary German Cr 8 SS Equivalent to 101 102 combined offered summer only Materials fee

160 Accelerated Beginning German (8 2) Cr 8 S *Prereq 2 3 years experience in another foreign language* Rapid introduction to written and spoken German within the context of German cultures accelerated approach to grammar and syntax Intended for students with proven ability to learn language rapidly Materials fee

***201 202 Intermediate German** (4 1) Cr 4 each Yr *Prereq 201 102 110 or 160 202 201* Review of grammar selected readings further practice in oral and written communication One section of 202 will emphasize commercial German Materials fee

301 Reading (3 0) Cr 3 F *Prereq 202* Emphasis on the development of reading skills through a variety of text types from contemporary German society compositions and review of advanced grammar Materials fee

302 Composition (3-0) Cr 3 S *Prereq 301* Emphasis on writing skills with further development of reading skills Materials fee

305 Advanced Conversation and Listening Comprehension (3-0) Cr 3 F S *Prereq 202 concurrent enrollment in 301 recommended* Intensive conversational and listening practice in German May be repeated to a maximum of 6 credits Materials fee

330 Introduction to German Literature (3 0) Cr 3 S *Prereq 301* Selected readings in German literature from Classicism to present Emphasis on techniques of reading and analysis of literary texts Materials fee

370 German Literature in English Translation (3 0) Cr 3 F Study of a particular period theme genre or author Topics chosen in light of student and faculty interest Readings discussions and written work in English *Materials fee*

375 Grimm s Tales (3 0) Cr 3 Alt S offered 1995 Introduction to Germanic antiquities mythology and heroic legends Herder s concept of Naturpoesie Emphasis on the Grimm tales theoretical approaches to the tales from the late 19th and early 20th centuries perversions of these traditional tales by the National Socialists (Nazis) *Readings in contemporary* Grimm scholarship Taught in English Materials fee

395 Study Abroad Cr 1 to 10 *Prereq 2 years university level German* Supervised instruction in *language and culture of Germany formal class* instruction at level appropriate to student s training augmented by practical living experience

401 Advanced Composition and Conversation (3-0) Cr 3 F *Prereq 302 305 Intensive practice in* composition and conversation selective grammar review Development of expression ideas idiomatic usage and syntax based on material selected from literature current newspapers and magazines

440 Topics in German Literature (3 0) Cr 3 F S *Prereq 302 330* F Genres S Periods or times (alt) May be repeated up to 9 credits for different offerings

471 German Civilization (3-0) Cr 3 or ((3 1) Cr 4 F *Prereq 302 and 330 for fourth credit* Study of various aspects of German history and culture prior to 1800 e g *earliest written documents* of the Germanic tribes Christianization the high Middle Ages Reformation the rise of Prussia Taught in English Fourth credit supplementary readings and compositions in German

472 German Civilization (3-0) Cr 3 or (3 1) Cr 4 S *Prereq 302 and 330 for fourth credit* Study of various aspects of German history and culture from 1800 to the present e g the Revolution of 1848 Bismarck and German Unification World War I the Weimar Republic National Socialism and World War II Postwar Germany Germany and the European Community Taught in English Fourth credit supplementary readings and compositions in German

480 Undergraduate Seminar (3-0) Cr 3 S *Prereq 401 440 junior or senior classification* Intensive study of a selected topic in literature language or pedagogy Designed as a capstone course for students completing a major in German

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in German and permission of department chair No more than 9 credits of Ger 490 may be counted toward graduation* Designed to meet the needs of students who seek work in areas other than those in *which courses are* offered or who desire to integrate a study of literature or language with special problems in major fields

493 Workshop in Second Language Teaching (German) (1 3) Cr 1 to 3 SS *Prereq Experience in teaching German* Intensive refresher course in written and oral German May be repeated to a *maximum of 9 credits* Materials fee

Greek (Greek)

For courses in Greek literature taught in English see *Classical Studies*

***101 102 Elementary Classical Greek** (4 1) Cr 4 each 101 F 102 S *Prereq 102 101* Grammar and vocabulary of ancient Attic Greek within the context of Greek culture reading knowledge through texts adapted from classical authors Materials fee

***201 Intermediate Classical Greek** (4 1) Cr 4 F *Prereq 102* Comprehensive review of grammatical principles emphasis on reading unadapted classical or Hellenistic texts Materials fee

342 Introduction to Classical Greek Literature (4 0) Cr 4 S *Prereq 201* Masterworks of ancient Greek literature with emphasis on critical analysis of style structure or thought Materials fee

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Greek and permission of department chair No more than 9 credits of Greek 490 may be counted toward graduation* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Italian (Ital)

***101 102 Elementary Italian** (4 1) Cr 4 each Yr *Prereq 102 101* Introduction to basic grammar and structure of the language use of the language laboratory supplemented by graded readings within the context of Italian culture Especially recommended as a second area of language study for majors in French and Spanish Materials fee

***201 202 Intermediate Italian** (4 1) Cr 4 each Offered as demand warrants *Prereq 201 102 202 201* Review of first year principles and expanded study of grammar development of written and spoken skills introduction to Italian civilization and literature through extracts from noted authors Materials fee

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Italian and permission of department chair No more than 9 credits in Ital 490 may be counted toward graduation* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Latin (Latn)

For courses in Latin literature taught in English see *Classical Studies*

***101 102 Elementary Latin** (4 1) Cr 4 each Yr *Prereq 102 101* Grammar and vocabulary of classical Latin within the context of Roman culture reading knowledge through texts adapted from classical authors Materials fee

***201 Intermediate Latin** (4-1) Cr 4 F *Prereq 102* Review of grammatical principles emphasis on reading unadapted texts from the Late Republic or Early Empire Materials fee

306 Composition and Oral Interpretation (2 0) Cr 2 S *Prereq 201 concurrent enrollment in 342* Practice in composition and in expressive reading of literary texts Emphasis on sensitivity to style idiomatic usage and effective written and oral expression Compositions based on readings in 342 Materials fee

342 Introduction to Latin Literature (3 0) Cr 3 S *Prereq 201* Masterworks of Latin prose or poetry with emphasis on techniques of literary and historical criticism Materials fee

441 442 Advanced Readings in Latin (3-0) Cr 3 each 441 F 442 S *Prereq 342* Study of individual authors or genres intensive readings in the original supplemented by modern criticism and analysis in English Authors and genres will vary courses may be repeated to a maximum of 6 credits each

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Latin and permission of department chair No more than 9 credits in Latin 490 may be counted toward graduation* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Portuguese (Port)

***101, 102 Elementary Brazilian Portuguese** (4 1) Cr 4 each Offered as demand warrants *Prereq 102 101* Introduction through the conversational approach within the context of Luso Brazilian culture Materials fee

211 Intermediate Conversation (4-0) Cr 4 Offered as demand warrants *Prereq 102 or equivalent* Intensive conversation review of grammar practice in writing reading of short original pieces All work in Portuguese Materials fee

340 Brazilian Civilization and Culture (3 0) Cr 3 each time taken Offered as demand warrants *Prereq 211 or equivalent* Introduction to Brazilian civilization and culture through the study of historical and literary texts Readings discussion and papers in Portuguese Materials fee

341 Portuguese Civilization and Culture (3 0) Cr 3 each time taken Offered as demand warrants *Prereq 211 or equivalent* Culture of Portugal through the study of Portuguese literary texts Readings discussion and papers in Portuguese Materials fee

440 Advanced Readings in Portuguese (3-0) Cr 3 each time taken Offered as demand warrants *Prereq 211 or equivalent* Study of individual authors genres or periods Intensive readings in original Luso/Brazilian texts supplemented by modern criticism and analysis in English Authors genres and periods will vary Readings discussion and papers in Portuguese

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Portuguese and permission of department chair No more than 9 credits in Port 490 may be counted toward graduation* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Russian (Rus)

Majors in Russian are required to complete 30 credits beyond the intermediate (201 202) level including 301 302 321 322 401 402 441, 442 and six hours of Russian history (Hist 421 and 422) required as supporting work

***101, 102 Elementary Russian** (4 1) Cr 4 each 101 F 102 S *Prereq 102 101* Introduction to the Russian language practice in the basic skills within the context of Russian culture Materials fee

160 Accelerated Beginning Russian (8 2) Cr 8 S SS *Prereq 2 to 3 years experience in another foreign language* Rapid introduction to written and spoken Russian within the context of Russian culture accelerated approach to grammar and syntax Intended for students with proven ability to learn language rapidly Materials fee

***201, 202 Intermediate Russian** (4 1) Cr 4 each 201 F 202 S *Prereq 201 102 or 160 202 201* Completion of elementary grammar selected readings further practice in oral and written skills Materials fee

301 302 Composition and Conversation (3-0) Cr 3 each 301 F 302 S *Prereq 301 202 302 301* Thorough study of the Russian language with emphasis on strengthening proficiency in writing speaking reading and listening Increased focus on syntax and word formation Materials fee

321 322 Russian Civilization (3-0) Cr 3 each Alt Yr offered 1994 95 321 F 322 S *Prereq 202* Topics selected from the history art architecture music and geography of Russia

370 Russian Literature in English Translation (3-0) Cr 3 Study of a particular period theme genre or author Topics chosen in light of student and faculty interests Readings discussions and written work in English May be repeated maximum of 6 credits Materials fee

395 Study Abroad Cr arr 1 to 6 *Prereq 2 years university level Russian* Supervised instruction in language and culture of the Soviet Union formal class instruction at level appropriate to student s training augmented by practical living experience

401 402 Advanced Composition and Conversation (3-0) Cr 3 each 401 F 402 S *Prereq 401 302 402 401* Intensive practice in composition and conversation with emphasis on mastery of listening skills Development of idiomatic usage and effective expression of ideas Increased emphasis on vocabulary building grammatical correctness and compatibility of style and content

441, 442 Literary Masterpieces of the Nineteenth and Twentieth Centuries (3 0) Cr 3 each 441 F 442 S *Prereq 202* Study of representative works by leading authors of the nineteenth and twentieth centuries

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Russian and permission of department chair No more than 9 credits of Rus 490 may be counted toward graduation* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

Spanish (Span)

Majors in Spanish are required to complete a minimum of 33 credits in courses numbered 300 and above The program has three areas of concentration literature language and applied language/culture For specific requirements consult the department

***101 102 Elementary Spanish** (4-1) Cr 4 each 101 F 102 F S *Prereq 102 101* Essentials of construction and vocabulary with an aural-oral approach and use of the language laboratory within the context of Hispanic culture Materials fee

110 Intensive Elementary Spanish Cr 8 SS Equivalent to 101 102 combined offered summer only Materials fee

160 Accelerated Beginning Spanish (8-2) Cr 8 S *Prereq 2 to 3 years experience in another foreign language* Rapid introduction to written and spoken Spanish within the context of Spanish culture accelerated approach to grammar and syntax Intended for students with proven ability to learn language rapidly Materials fee

***201, 202 Intermediate Spanish** (4-1) Cr 4 each 201 F 202 F S *Prereq 201 102 110 or 160 202 201* Review of the basic elements of the language Further intensive practice in oral communication Directed practice in writing Development of fluency with idiomatic expressions Selected readings Materials fee

301 Spanish Grammar and Composition (3-0) Cr 3 F S *Prereq 202 or 4 years of high school Spanish* Review of grammar and application of grammar concepts for development of writing and reading skills within the context of Hispanic culture Materials fee

303 Spanish Conversation (3-0) Cr 3 F S *Prereq 202 or 4 years of high school Spanish* Intensive oral practice and improvement of oral proficiency Application of specific grammar concepts for development of conversational skills Materials fee

314 Introduction to Reading Hispanic Texts (3-0) Cr 3 F S *Prereq 301 or 303* Critical reading of Hispanic literary texts Presentation of techniques and terminology of literary criticism Study of basic genres narrative poetry drama essay Materials fee

321, 322 Spanish and Ibero-American Civilization (3-0) Cr 3 each 321 F 322 S *Prereq 202* A survey of the art and architecture the social and political structure and the cultural heritage of the Hispanic world 321 Peninsular culture and civilization 322 Ibero American culture and civilization Materials fee

330 331 332 Survey of Hispanic Literature (3-0) Cr 3 each 330 F 331 S 332 S *Prereq 314* Highlights of Hispanic literature from the Middle Ages to the present techniques of literary criticism Lectures discussion and analysis of individual selections 330 Peninsular literature from the earliest times to the Golden Age 331 Peninsular literature from the eighteenth century to the present 332 Spanish American literature from the earliest times to the present Materials fee

350 Spanish for Business and Professions (3-0) Cr 3 S *Prereq 202 or 201 and permission of instructor* Introduction to basic business terminology banking management marketing shipping and invoicing for export-import etc Emphasis on composition and letter writing Grammar review as needed Individual projects will focus on special interests computers accounting agriculture technical writing etc Materials fee

370 Spanish Literature in English Translation (3 0) Cr 3 Study of a particular period theme genre or author Topics chosen in light of student and faculty interests Readings discussions and written work in English May be repeated to a maximum of 6 credits Materials fee

395 Study Abroad Cr 1 to 10 *Prereq 2 years university level Spanish* Supervised instruction in Hispanic language and culture formal class instruction at level appropriate to student s training augmented by practical living experience

401 Advanced Composition and Grammar (3-0) Cr 3 F *Prereq 301* Advanced study of Spanish grammar and syntax Students writing of compositions incorporate an advanced understanding of grammar syntax and principles of organization of thought and ideas

403 Advanced Conversation (3-0) Cr 3 S *Prereq 303* Intensive oral practice Development of fluency in the use of idiomatic expressions and application of grammar and syntax concepts to conversational skills Emphasis on organization of speeches and other oral presentations

441 Spanish Literature from Medieval Times to the Golden Age (3-0) Cr 3 *Prereq 330* Alt F offered 1993 Discussion and analysis of major trends and figures in Medieval and Golden Age prose drama and poetry May be repeated for different offerings to a maximum of 6 credits

442 Spanish Literature of the 19th Century (3-0) Cr 3 *Prereq 330 331 or 332* Alt S offered 1995 Discussion and analysis of representative works authors and literary trends from Romanticism through Generation 98 May be repeated for different offerings to a maximum of 6 credits

443 Spanish Literature of the 20th Century (3-0) Cr 3 Alt F offered 1994 *Prereq 330 or 331* Topics include such themes as social protest in the post war novel modernism and surrealism in poetry and drama etc May be repeated for different offerings to a maximum of 6 credits

444 Spanish American Literature from Colonial Times to Independence (3-0) Cr 3 *Prereq 330 or 332* Alt S offered 1994 Study and analysis of representative works literary schools and movements of this period May be repeated for different offerings to a maximum of 6 credits

445 Spanish American Literature from Independence to the Present (3-0) Cr 3 Alt F offered 1994 *Prereq 330 331 or 332* Critical and analytical study of the foremost Spanish American narrative poetry and drama May be repeated for different offerings to a maximum of 6 credits

480 Seminar in Hispanic Literature (3 0) Cr 3 each time taken S *Prereq 330 331 or 332* Advanced study of a selected topic in Hispanic literature and literary criticism

490 Independent Study Cr 1 to 6 each time taken *Prereq 6 credits in Spanish and permission of department chair No more than 9 credits in Span 490 may be counted toward graduation* Designed to meet the needs of students who seek work in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields

493 Workshop in Second Language Teaching (Spanish) (1 3) Cr 1 to 3 SS *Prereq Experience in teaching Spanish* Intensive refresher course in written and oral Spanish May be repeated to a maximum of 9 credits

494 Hispanic Dialectology (Ling 494) (3-0) Cr 3 Alt S offered 1994 *Prereq 301 or 350 Engl 219 F Lng 491 recommended* History of the Spanish language with intensive study of the phonology morphosyntax and lexicon of the Hispanic dialects of Spain and Latin America by use of texts audio tapes and native informants

496 Contrastive Analysis of Spanish/English Syntax (Ling 496) (3 0) Cr 3 Alt S offered 1995 *Prereq 301 or 350 Engl 219 F Lng 491 recommended* Introduction to linguistic study of the major differences between the two grammatical systems with emphasis on those areas of contrast vital to the teacher of Spanish Extensive practice exercises

Special Courses in Foreign Languages (F Lng)

486 Methods in Elementary School Foreign Language Instruction (El Ed 486) (3-0) Cr 3 S *Prereq 25 credits in a foreign language* Current educational methods and their application in the elementary school classroom Special emphasis on planning evaluation and teaching strategies Actual practice in some of the techniques Materials fee

491 Applied Linguistics for Foreign Language Teachers (Ling 491) (3-0) Cr 3 F French (Alt years offered 1994) S Spanish (Alt years offered 1995) *Prereq 3 years of university study of the appropriate language* Phonetics phonology and morphology of French or Spanish Theories of syntax and semantics History and analysis of language teaching methods Psychology of the foreign language learner Selection and preparation of materials

492 History of the Romance Languages (Ling 492) (3 0) Cr 3 S *Prereq Reading knowledge of Latin or a modern Romance language* From pre-classical Latin to the modern Romance languages emphasizing both internal history (changes in sounds and forms) and external history (the social political and geographic context in which the language is spoken) Methods of historical linguistics *Readings in earliest texts*

496 Methods of Teaching Foreign Languages (SecEd 496) (6-0) Cr 3 F *Prereq 25 credits in a foreign language* Current educational methods and their applications to the classroom Special emphasis on planning objectives and teaching techniques Actual practice in some of the techniques Materials fee

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*Credit by examination (test out exams) in the Department of Foreign Languages and Literatures for courses numbered 101 102 201 and 202 is available only to students who are not currently enrolled in the course Credit by examination for other courses in the department is normally not available

Forestry

Steven E Jungst Chair of Department

Professors Countryman Hall Hart Hinz Jungst Manwiller McNabb Prestemon Schultz Wray

Emeritus Professors Bensend Hopkins Thomson

Associate Professors Colletti Kuo Mize

Assistant Professor Rule

Undergraduate Study

The Department of Forestry offers courses that are concerned with the management of forests for multiple benefits and the production of forest products The department offers work for the bachelor of science degree with a major in forestry and options in forest resource management or forest products The undergraduate program is accredited by the Society of American Foresters The purpose of the undergraduate curriculum in forestry is to prepare students for professional employment in management and utilization of natural resources and to equip them to function effectively in a complex society Elective courses in forest resource management can be selected to emphasize forest ecology wildlife wilderness and recreation management water quality and erosion protection quantitative-analytical techniques business and marketing and other areas related to natural resource management Similarly elective courses in the forest products option can be selected to emphasize wood production business and marketing and quality assurance

Many private firms as well as national regional state and local agencies seek forestry graduates to fill positions in management of natural resources for multiple benefits including timber water recreation water quality erosion protection habitat management and biodiversity Graduates in forestry are prepared to be involved with evolving forestry systems such as agroforestry and urban forestry Wood processing industries such as composite products plywood particle board lumber and pulp and paper offer professional opportunities in production product development quality control and marketing

With appropriate graduate study the range of opportunities is expanded to include research and education as well as more specialized administrative positions

During fall semester of the second year of study (sophomore year typically) forestry students are required to enroll in the department s integrated forestry modules consisting of For 201 202 203 204 205 and 206 That semester, consisting entirely of forestry coursework is designed to give students an early understanding of the many aspects of forestry and how they are interrelated In addition to work in the classroom students will spend time in laboratory and field work each week A 3-week field trip during the semester will reinforce concepts learned both in the classroom and during laboratory/field sessions Transfer students should check with the department for counsel on timing their completion of the integrated forestry modules

The department participates in interdisciplinary programs in pest management plant health and protection and international studies (see *Index*) By proper selection of elective courses forestry students can obtain a second major in these programs or in other disciplines

The department offers a minor in forestry which can be earned by completion of a minimum of 15 credits in forestry courses Students wishing to emphasize management and environmental aspects of forestry must select at least 15 credits from the following courses 101 300 302 310 390 407 445 Students wishing to emphasize forest products and wood utilization must complete 280 and an additional 12 credits from the following courses 281 481 483 485 486 487, 488

Graduate Study

The department offers programs leading to the degrees master of science and doctor of philosophy with a major in forestry and minor work to students taking major work in other departments Areas of specialization for the M S degree are forest administration and management forest biology forest biometry forest economics and marketing and wood science Areas of specialization for the Ph D are forest biology-wood science forest biometry and forest economics The graduate program is open to and suitable for students who have majored in forestry or related natural resource fields A nonthesis master s option is available All students are required to teach and conduct research as part of their training for the Ph D degree

The department participates in the M B A with specialization in the agriculture program administered by the College of Business providing an opportunity to obtain an M B A degree while taking advanced courses in forestry and maintaining contact with the profession of forestry The department also participates in interdepartmental majors in ecology and evolutionary biology plant physiology genetics and water resources and the interdepartmental minor in mineral resources (See *Index*)

Open to graduate students for minor credit only 301 302 342 407 445, 451 453 454 481, 483 485, 486 487, 488

Courses Primarily for Undergraduate Students

101 Introduction to Forestry (2 0) Cr 2 F Historical development of forestry in the United States Current science and practice of forestry Forests as producers of goods and services that meet human needs Forest resource conflicts issues and policy

104 Practical Work Cr R Practical work experience in forestry See adviser for departmental requirements

110 Orientation in Forestry (1-0) Cr R F Orientation to the academic process as preparation for professional careers in forestry Career opportunities

201 Forest Biology (2-0) Cr 2 F *Prereq Concurrent classification in 202 203 204 205 and 206* Tree identification tree biology silvicultural principles succession and population community and ecosystem ecology Ecosystem energy flow soils nutrient and water cycling Environmental roles that trees play in the Midwest the nation and the world

202 Harvesting/Wood Utilization (2-0) Cr 2 F *Prereq Concurrent classification in 201 203 204 205 and 206* Modern harvesting principles and practices Best management practices (BMPs) for controlling soil erosion associated with harvesting Wood as a material processing of wood and wood fiber into products end uses of wood products and technological changes in processing and end-use

203 Resource Measurements/Evaluation (2 0) Cr 2 F *Prereq Concurrent classification in 201 202 204 205 and 206* Survey techniques involved in quantification valuation and evaluation of tree and stand growth and other variables in the forest environment (e g recreational use water quantity and quality wildlife habitat value biomass and solid wood) Geographic Information Systems (GIS) and remotely sensed data

204 Multiple Use Decision Making (2 0) Cr 2 F *Prereq Concurrent classification in 201 202 203 205 and 206* Current issues relating to public private and urban forests Identification of processes services and goods produced by the forest and expected by the publics such as those related to wildlife water range recreation wilderness biodiversity carbon sequestering as well as wood and fiber products Methods of decision making including communications and conflict resolution

205 Integrated Forestry Laboratory (0-8) Cr 3 F *Prereq Concurrent classification in 201 202 203 204 and 206* Field and laboratory exercises integrating the management of forest goods services and the processing of wood products

206 Forestry Field Trip Cr 4 F *Prereq Concurrent classification in 201 202 203 204 and 205* Three week field trip to address topics and issues covered in 201 202 203 204 and 205

230 Cooperative Education Cr R *Prereq Permission of departmental chair* Required of all cooperative education students Students must register prior to commencing each work period

256 Dendrology (Bot 256) See *Botany*

280 Wood Anatomy and Properties (3 0) Cr 3 S Consideration of important basic properties and how such properties relate to proper use

281 Wood Identification (0 3) Cr 1 S Comparative anatomical characteristics and hand lens identification of commercially important North American woods

310 Management of Small Forest Properties (2 0) Cr 2 S Techniques of forest management with emphasis on small private holdings Intended for nonmajors but open to forestry majors by special arrangement with the instructor

301 Forest Ecology (Pl HP301) (3 3) Cr 4 F *Prereq Bot 207 or a course in biology* Effects of genetic physiological soil and environmental factors on forest ecosystem dynamics Emphasis on human influence on the forest ecosystem

302 Silviculture (2-3) Cr 3 S *Prereq 201 301* Manipulation of forest vegetation based on ecological principles for the production of goods and services

342 Dynamics of Forest Stands (3-3) Cr 4 S *Prereq 203* Examination of factors affecting individual tree and forest growth Estimation of growth and yield of even-aged and all-aged stands Review of simple linear regression and introduction to multiple regression

390 Forest Fire Protection and Management (3-0) Cr 3 F Characteristics and role of fire in forest ecosystems Major topics covered include fuels fire weather fire behavior fire danger rating systems fire control and prescribed burning

407 Forest Watershed Management (2-3) Cr 3 S *Prereq 301 or a course in general biology* The physical and biological phenomena associated with water quality quantity and timing from forest and wildland ecosystems Effect of natural vegetation management agroforestry systems atmospheric deposition and introduced chemicals on the hydrologic cycle Best management practices for reduction of nonpoint source pollution Fee for field trip

416 Forest Pest Management (Pl P 416) See *Plant Pathology*

445 Natural Resource Photogrammetry and Photo Interpretation (2 3) Cr 2 to 3 S *Prereq Junior classification Nonmajors should enroll for 2 credits majors should enroll for 3 credits* Use of aerial photos and remotely sensed imagery in resource management with emphasis on multiple use forestry Training in techniques of photo measurement interpretation and mapping plus procedures for forest inventory Principles of remote sensing 2-credit course terminates at end of 11 weeks

451 Forest Resource Economics and Quantitative Methods (3-3) Cr 4 S *Prereq 203 Econ 201 Math 150* Application of economic principles to forest resource management Methods of identifying and specifying problems in the management and use of forest resources Application of mathematical and statistical models to the solution of managerial problems

452 Forest Resource Management (2 3) Cr 3 F *Prereq 451* Principles of organizing planning regulating and decision making associated with public and private forests Optimization of multiple goal forestry with resource and policy constraints Integrated forest resources management and analysis of New Forestry concepts

453 Forest Resource Policy and Administration (3-0) Cr 3 S *Prereq 451* Functions of administration personnel management and project administration Contemporary forest resource policies and issues Processes involved in the formulation of public and private policy Legal opportunities and restraints Conflict resolution Historical development of forest resource policy

454 Forest Resource Case Studies (1-4) Cr 3 S *Prereq 20 credits in student s major at 300 level or above* Integrated case studies of forest resources management and utilization to illustrate methods of integrating economic ecological social political and administrative principles discussed in preceding courses Emphasis on decision making Field trips and discussion sessions arranged

481 Chemical Conversion of Wood (2 3) Cr 3 Alt S offered 1995 *Prereq 280* Chemical properties of wood Pulp and paper technology Other fiber products Cellulose derivatives

483 Wood Deterioration and Preservation (Pl P 483) (2 3) Cr 3 Alt F offered 1993 *Prereq 280* Deterioration by biological and physical agents of wood in use Wood preservation and fire retardant treatments

485 Adhesive Bonded Wood Products (2-3) Cr 3 Alt F offered 1994 *Prereq 280* Production of laminated wood plywood particleboard and medium density fiberboard includes wood variables adhesives processes use of wood residues and combining wood with other materials

486 Wood Drying (2 3) Cr 3 Alt S offered 1994 *Prereq 280* Movement of liquids and gases in wood Seasoning techniques Swelling and shrinkage of wood and dimensional stabilization treatments

487 Physical Properties and Conversion of Wood (2 3) Cr 3 Alt S offered 1994 *Prereq 280* Timber mechanics thermal and acoustical properties wood machining lumber grading

488 Wood Use and Construction (2-0) Cr 2 Alt S offered 1995 *Prereq 280 or one professional course in student s major* Selection and application of forest products in building construction including grading building systems fasteners moisture control wood preservation and durability of structures thermal and acoustical systems fire safety wood finishing and maintenance codes and regulations and wood as a home heating fuel

490 Independent Study Cr 1 to 4 each time elected *Prereq Junior classification permission of instructor A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation*

A Forest Biology
B Forest Biometry
C Forest and Recreation Economics
D Forest Management
E Wood Science
G Forest Photogrammetry
H Honors Program
I Forest Recreation Resource Management

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 Forest Tree Improvement and Genetics (2 3) Cr 3 F *Prereq Gen 330 or Biol 301 Agron 421* Genetic principles as they apply to selection and breeding of forest trees Variation and genetic systems in trees selection techniques polyploidy floral biology cloning hybridization techniques and operational tree improvement programs

504 Advanced Forest Ecology and Silviculture (3 3) Cr 4 Alt F offered 1994 *Prereq 301* Detailed analysis of factors and processes underlying forest and stand growth and development Applications of this knowledge to forest culture Discussions of regional silviculture agroforestry and experimentation in forest biology Fee for field trip

505 Forest Nursery Science (2-3) Cr 3 Alt S offered 1995 *Prereq 2 courses in biology* Procurement of seed seed orchard management and techniques for producing forest tree seedlings in the conventional bare root nursery and the controlled environment container facility Emphasis on physiological basis with hands on experience in cultural practices including asexual propagation

510 Seminar (1-0) Cr 1 each time taken S *Prereq Permission of instructor* Reports of research and current literature Techniques of proper platform presentation

543 Forest Biometry (3-0) Cr 3 Alt F offered 1993 *Prereq Stat 401 permission of instructor* Development of volume and taper functions Examination of measures of site quality and density and growth models Application of sampling methods to forest research surveys

550 Advanced Quantitative Methods in Forestry (2 3) Cr 3 Alt F offered 1994 *Prereq One course in quantitative analysis or systems analysis* Advanced quantitative methods as applied to forestry management problems Linear programming dynamic programming PERT/CPM simulation and other modeling techniques

570 Resource Allocation in Forestry (2-2) Cr 3 Alt F offered 1993 *Prereq 451* Analytical approach to economic aspects of forest resource management problems Current problems in the allocation of resources in forestry Implications of current research for the analyst and manager

587 Advanced Topics in Wood Science (2-0) Cr 2 Alt F offered 1994 *Prereq 280* Recent contributions of research and technology to product development Areas of emphasis in basic and applied research

590 Special Topics Cr 1 to 4 each time elected *Prereq Permission of the instructor*

A Forest Biology
B Forest Biometry
C Forest and Recreation Economics
D Forest Management
E Wood Science
G Forest Photogrammetry
I Forest Recreation Resource Management
J Wood Anatomy and Microtechniques
K Wood Chemistry
L Wood Physics
M Wood in Structures

594 Advanced Forest Resource Management (3 0) Cr 3 Alt F offered 1994 *Prereq 454* A seminar approach to the critical analysis of forest management problems as exemplified in public agencies and private firms

599 Creative Component Cr 1 to 8

A Forest Biology
B Forest Biometry
C Forest and Recreation Economics
D Forest Management and Administration
E Wood Science

Courses for Graduate Students, major or minor

601 Research Methods (2-0) Cr 2 F Forestry graduate student orientation Scientific method project and study planning and preparation and critical analysis of study plans Communication of research results Institutional factors in research

602 Advanced Topics in Forest Biology (1-0) Cr 1 Alt S offered 1995 *Prereq Permission of instructor* Presentation of papers and discussions of topics on selected areas in advanced forest biology May be taken up to three times for credit

603 Tree Growth and Development (4 0) Cr 4 Alt S offered 1994 *Prereq 301 or a course in plant physiology* Integration of vascular plant anatomy nutrition metabolism and growth regulation specific to woody plants Major topics include woody plant meristems structure and function water relations internal carbon cycle and growth regulation

654 Advanced Topics in Forest Economics (1-0) Cr 1 Alt S offered 1995 *Prereq 451* Discussion and presentation of advanced forest economic problems with particular attention to recent theories and applications Emphasis on applications of micro and macroeconomic principles to forest resource allocation and long range planning May be taken twice for credit

688 Formation of Wood (3-0) Cr 3 Alt S offered 1995 *Prereq 280 Formation of cell wall in woody* plants wood quality study of wood by microscopy and microbeam methods

696 Seminar in Plant Physiology and Molecular Biology (Bot 696) See *Botany*

699 Research Cr 1 to 8
A Forest Biology—Wood Science
B Forest Biometry
C Forest Economics
D Forest Management and Administration
E Wood Science
F Plant Physiology

General Graduate Studies

(Interdepartmental Graduate Program)

Supervisory Committee P M Keith Chair J S Ruebel (Arts and Humanities) E C Powell (Biological Sciences) C O Hausafus (Family and Consumer Sciences Studies) P M Keith (General) E C Jones (International Development Studies) C L Tipton (Physical Sciences) S J Crase *(Social Sciences)*

The degree master of science or master of arts with major in general graduate studies is available to graduate students who wish to have a more diversified program of advanced study than that generally permitted students who specialize in a single subject Areas of specialization in arts and humanities biological sciences family and consumer sciences studies international development studies physical sciences and social sciences are designed to broaden and *supplement a student s program Students* must take courses in three different graduate subject matter areas each subject contributing a minimum of nine credits toward the 35 graduate credits required for the degree Courses which may be used for credit toward this degree program are selected from those listed in the *Graduate College Catalog* for graduate credit

Both thesis and nonthesis options are available If the thesis option is chosen a maximum of three credits in Gr St 699 (Research) is required and a maximum of five credits in Gr St 699 may be counted in the total of 35 required credits If the nonthesis option is elected evidence of original creative effort must be presented This may be in the form of a demonstration of independent creativity such as a written report of laboratory field or library research a project in fine arts or some other original contribution acceptable to the student s committee In the nonthesis option a minimum of three credits in Gr St 599 (Creative Component) is required and a maximum of five credits in Gr St 599 may be counted toward the total of 35 graduate credits

The student in consultation with the program of study committee will decide on the option The committee also aids the student in planning a program of study and in selecting appropriate courses

Foreign language requirements if any will be decided by the student s committee

Students who wish to apply for admission to general graduate studies should communicate with the chair of the supervisory committee or one of its members (see above)

Fall semester admission to this program is preferred Applications should be submitted by March 15

Courses for Graduate Students

599 Creative Component Cr var

600 Examination Only Cr R

680 Continuous Registration Cr R

699 Thesis Research Cr var

Genetics

(Interdepartmental Graduate Major)

Supervisory Committee J K Stadler Chair C R Bronson R J Hoffman S R Rodermel P Schnable

Participating Faculty L Ambrosio A G Atherly T B Bailey R M Benbow P J Berger C R Bronson R P Cantrell L L Christian M D Enger C F Ford A E Freeman J R Girton R B Hall A R Hallauer D J Hannapel E R Henderson R J Hoffman K M Johansen E S Krafsur K R Lamkey S J Lamont D Larson M Lee J E Mayfield W A Miller W J Miller F C Minion A M Myers B J Nikolau R G Palmer P A Peterson E Pollak S R Rodermel M F Rothschild P S Schnable R C Shoemaker M H Spalding J K Stadler L C Stephens W L Summers R W Thornburgh C K Tuggle D F Voytas R S Wallace J F Wendel R L Willham R P Wise A D Wright

Undergraduate Study

Undergraduates wishing to prepare for *graduate study in genetics should elect* courses in basic biology chemistry at least through organic chemistry one year of college-level physics mathematics at least through calculus and at least one thorough course in basic transmission and molecular genetics One year of upper level statistics and a year of biochemistry are strongly encouraged Qualified undergraduates may take Gen 420 and /or Gen 430 as introduction to graduate study in genetics

A bachelor of science degree in genetics is *offered by the Department of Zoology and* Genetics

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in genetics in twelve cooperating departments Agronomy Animal Science Biochemistry and Biophysics Botany Entomology Food Science and Human Nutrition Forestry Horticulture Plant Pathology Statistics Microbiology Immunology and Preventive *Medicine and Zoology and* Genetics

The diversity of faculty in the interdepartmental genetics program ensures a broad well balanced education from the best instructors while offering flexibility in choice of specialization Genetics faculty have strengths in many areas from fundamental studies at the molecular cellular organismal and population levels to research with immediate practical application Ongoing research projects span all the major areas of theoretical and experimental genetics *including molecular studies of gene regula*tion gene mapping transposable element studies developmental genetics quantitative and mathematical genetics evolutionary genetics and population genetics

First-year students majoring in genetics may enter the interdepartmental genetics program by either of two routes by direct admission to the interdepartmental genetics program or by admission to a department participating in the program followed by formal admission to the program Students admitted directly into *the interdepartmental genetics program will* take Genet 697 (graduate research rotation) in their first two semesters and by the end of their second semester enter a department by choosing a major professor from the participating faculty Students first admitted by a department will do research rotations within that department only and choose a major professor from participating interdepartmental genetics faculty in that department

All Ph D candidates take a core curriculum comprising one course each from the following four categories and attend seminars and workshops as described Advanced Genetics (Gen 545) Molecular Genetics (Gen 505 or B B 502) Quantitative and Population Genetics (An S 550 or Stat 436 or Gen 515 or Gen 562) Biochemistry (B B 404 or B B 501) Students will make research presentations attend genetics faculty seminars and participate in four Workshops in Genetics (Genet 591) in the training period First year graduate students will also take Genet 692 (Seminar in the Conceptual Foundations of Genetics) M S students will take the above core courses and seminars but will participate in only two workshops in genetics Additional coursework may be selected to satisfy individual interests or departmental requirements a list of recommended electives is available in the genetics office The foreign language requirement and teaching requirement are determined by the student s major department

The course designator *Genet* applies to graduate courses taught by the interdepartmental program in genetics The course designator *Gen* applies to courses taught by the Department of Zoology and Genetics (see separate listing)

Students minoring in genetics at the Ph D level must meet the following requirements Completion of three of the four categories of the common-core required lecture courses listed above One semester of seminar in genetics (Genet 690 or 691 or 692) is recommended One member of the POS committee must be a genetics faculty member

Courses for Graduate Students, major or minor

590 Special Topics Cr arr

591 Workshop in Genetics (1 0) Cr 1 each time taken F S *Prereq Permission of instructor* Current topics in genetics research Lectures by off campus experts Students read background literature attend preparatory seminars attend all lectures meet with lecturers

690 691 Seminar in Genetics (1-0) Cr 1 each time taken F S *Prereq Permission of instructor* 690 F Student research presentations 691 S Faculty research series

692 Seminar in the Conceptual Foundations of Genetics (1-0) Cr 1 F *Prereq Permission of instructor* Student and faculty presentations of landmark papers in genetics Brief history of ideas of the period included as background material

697 Graduate Research Rotation Cr var F S Graduate research projects performed under the supervision of selected faculty members in the interdepartmental genetics program

699 Research

Geological and Atmospheric Sciences

Carl F Vondra Chair of Department

Professors Chen Nordlie Richardson Seifert Takle Vondra Yarger

Emeritus Professors Hussey Lemish

Associate Professors Branstator Cody DeLuca Hallberg Jacobson Spry Tribbia Windom

Assistant Professors Gutowski Kramer Simpkins

Undergraduate Study

The department offers courses in geology and meteorology Majors can be earned in earth science (B A B S) geology (B S) and meteorology (B S) Candidates for all degrees must satisfy the requirements established by the College of Liberal Arts and Sciences (see *Liberal Arts and Sciences Curriculum*) In addition the department has requirements for each major

The bachelor of science in geology stresses the needs of the professional geologist Required geology courses total 48 credits and include Geol 100 100L 102 102L 302, 311 313, 356 365 366 412 471 475 and 3 credits in geology electives Required supporting courses include Chem 163 163L 164 164L and 210 or 211 Phys 111 and 112 or 221 and 222 Math 165 166 plus two of the following courses Math 265 266 Com S 205 or 207, and an introductory statistics course The department offers a minor in geology which may be earned by credit in Geol 100 100L 102 102L plus 7 credits at the 300 level or above No more than 9 credits in 490 may be counted toward a degree in geology

The study of meteorology involves the description of the earth's atmosphere and the processes responsible for its behavior Students majoring in meteorology earn the bachelor of science The program normally includes the following courses Mteor 101 301 301L 302 302L 341 342 404 443 454 454L 455 455L and 499 A grade of C or better (not C–) is required in the following courses to meet minimum graduation requirements for a bachelor of science degree in meteorology Mteor 301 301L 302 302L 341 342 404 443 454 454L 455 and 455L Supporting work is required in areas at least equivalent to Chem 163 163L 164 Phys 221 222 Math 165 166 265 266 Com S 205 Stat 105

Several co-op programs are available for upper division undergraduates Although a range of opportunities exists for men and women who terminate their studies with a bachelor of science students who meet the necessary academic standards are encouraged to continue their studies in a graduate program For these students minor work is recommended in a mathematical or physical science Other students can choose a wide range of supporting courses that will contribute to their particular area of interest in meteorology

The department offers a minor in meteorology which may be earned by completing 15 credits including Mteor 301 301L 302 and 302L Further information concerning programs of study including sample degree programs is available from the department

The earth science major is a broad program that typically emphasizes an interdisciplinary field Programs leading to the bachelor of science may be individually designed but will include required courses in geology and meteorology and required supporting work in chemistry physics, and mathematics Specific programs have been designed for students interested in a geology meteorology or an environmental earth science emphasis Programs leading to the bachelor of arts for earth science teaching are available The latter program must satisfy the requirements of the Teacher Education Program (see *Index Teacher Education*)

English proficiency requirement The department requires a grade of C or better in English 104 and 105 (or 105H) and a C or better in English 314 or Jl MC 347

Graduate Study

The department offers programs leading to the master of science and doctor of philosophy with majors in earth science geology and meteorology Program options are available for the M S and Ph D degrees in earth science leading to careers in teaching The department also cooperates in the interdepartmental major in water resources and in the interdepartmental minor in mineral resources (see *Index*) Students desiring a major in the above fields normally will have a strong undergraduate background in the physical and mathematical sciences Individuals desiring to enter a graduate program are evaluated by considering their undergraduate background and performance and their expressed goals

Programs of study are designed on an individual basis in accordance with requirements of the Graduate College and established requirements for each departmental major Minor work is normally taken in aerospace engineering chemistry computer science engineering mechanics mathematics metallurgy, physics, soils soils engineering or statistics Departmental requirements provide a strong broad background in the major and allow considerable flexibility in the program of each individual

A dissertation is required of all Ph D candidates M S students normally are required to complete a thesis although a nonthesis option is offered for the M S degree in earth science and in meteorology

The following courses are open to graduate students for minor graduate credit only Geol 302 311 313 356 365 366 400 471 475 481 488 Mteor 301 301L 302 302L, 306 341 342, 404 406 443 454 454L 455 455L

Geology (Geol)

Primarily for Undergraduate Students

100 The Earth (3-0) Cr 3 or (3-1) Cr 4 F S SS Richardson Staff What is the earth made of and how does it work? Emphasis on observations and hypotheses used by geologists to determine the earth s structure and to understand how geologic features change with time Students who enroll for the extra credit option must register for a one hour discussion section Students enrolling for either option may also enroll for Geol 100L

100L The Earth Laboratory (0 2) Cr 1 F S *Prereq Credit or enrollment in 100* Characterization of rocks and minerals interpretation of structures and landforms Materials fee

101 Earth in Crisis (3 0) Cr 3 or (3-1) Cr 4 F Cody Seifert Recognizing and living with geologic hazards such as earthquakes volcanic activity and flooding the geologic consequences of human modifications Students who enroll for an extra credit option must register for a one hour discussion section

102 History of the Earth (3-0) Cr 3 or (3-1) Cr 4 S *Prereq 100 or 301* Vondra The earth s physical and biological evolution concepts of global tectonics Methods used to decipher earth history Students who enroll for the extra credit option must register for a one hour discussion section Students enrolling for either option may also enroll in Geol 102L

102L History of the Earth Laboratory (0-2) Cr 1 S *Prereq Credit or enrollment in 102* Introduction to the use of sedimentary rocks and fossils in reconstructing the earth s history Materials fee

103 The Global Water Cycle (3-0) Cr 3 or (3 1) Cr 4 F Richardson Focus on the global distribution of water on the pathways and processes by which water moves and on the role of water in modifying the earth s surface Students who enroll for the extra credit option must register for a onehour discussion section

106 Earth Environment (2 2) Cr 3 S Richardson The interrelating physical characteristics of earth s atmospheric hydrospheric and lithospheric systems as they relate to climate soil and landform development and the impact of their spatial distribution on occupants of earth

201 Geology for Engineers (2 3) Cr 3 F S Nordlie Introduction to physical geology emphasizing engineering applications and materials Materials fee

290 Independent Study Cr 2 to 4 each time taken *Prereq Permission of instructor*

302 Summer Field Studies Cr 6 to 8 SS *Prereq 102 311 356 365* Vondra Aerial mapping structural stratigraphic and geomorphologic

nalyses Written reports with appropriate lustrations required An 8-week summer field ourse required of all geology majors Summer amp fee

106 Geology Field Trip Cr 2 each time taken S SS May be taken more than once *Prereq 100 r 201 permission of instructor* Staff Geology of elected regions studied by correlated readings ollowed by a field trip to points of geologic interest en day field trip required Field trip fee

111 Mineralogy and Crystallography (3 2) Cr 4 *Prereq 100 or 201 Chem 163* Windom ntroduction to mineral classification elementary crystallography crystal morphology Laboratory nvolves problems in crystallography mineral dentification and x ray diffraction Materials fee

313 Optical Mineralogy (1 2) Cr 2 S *Prereq 311* Spry Introduction to using the microscope for mineral identification Optical properties of minerals n immersion oils and in thin section Materials fee

356 Structural Geology (2-4) Cr 4 Alt S offered 1994 *Prereq 100 or 301 Phys 111 or 221 (preferred) Math 165* Jacobson Description and classification of structures in sedimentary metamorphic and igneous rocks Introduction to mechanical principles as related to deformational behavior of rock bodies in different environments *Laboratory includes application* of geometrical techniques to solve structural problems emphasizes map interpretation and use of stereonet and computer methods *Materials fee*

365 366 Petrology 365 (3 3) Cr 4 Alt F offered *1994 366* (3 3) Cr 4 Alt S offered 1995 *Prereq 365 302 313 366 365* 365 Seifert Jacobson Nature and origin of rocks as a function of environmental conditions Emphasis on *description* of rocks and on the conditions under which they form Laboratory involves characterization of rocks in hand specimen and in thin sections 366 Jacobson Cody Igneous rocks introduction to sedimentary processes Sedimentary and metamorphic rocks Materials fee

400 Advanced Field Geology Cr 6 to 8 SS *Prereq 302* Vondra An 8-week field course for advanced geology majors emphasizing advanced field techniques and providing students with experience in analyzing geologic field problems Summer camp fee

412 Paleontology (2 2) Cr 3 Alt S offered 1994 *Prereq 102* Cody Interrelationships of biologic and geologic systems Nature of the fossilization process characteristics of fossils uses of fossil remains in determining paleoecology *paleogeography and broad trends in evolution* Materials fee

471 Sedimentation (2 2) Cr 3 Alt F offered 1993 *Prereq 302 and an introductory statistics course* Vondra Source dispersal accumulation and *diagenesis of sediments in terrestrial* transitional and marine environments Field trips Materials fee

***474 (574 DL) Glacial and Pleistocene Geology** (2 2) Cr 3 Alt S offered 1995 *Prereq 100 or 201 or equivalent experience* Depositional and erosional processes of glaciers and their effect on the landscape glaciology sea level change Quaternary stratigraphy and studies of modern *glacial analogs* lab emphasizes aerial photo interpretation and Midwestern Pleistocene stratigraphy Field trip fee

***475 (575 DL) Geomorphology** (2 2) Cr 3 Alt S offered 1994 *Prereq 100 or 201 or equivalent experience* Weathering erosion and sediment production analysis of landforms and processes in fluvial arid/semiarid glacial periglacial karst coastal and volcanic environments Field trip fee

481 Earth Resources (2 2) Cr 3 Alt F offered 1994 *Prereq 365* Staff Review of major processes which concentrate economically important materials in the earth Nature and origin of metallic and nonmetallic ore deposits petroleum and coal Laboratory emphasizes the study of economic *minerals* from metallic deposits Materials fee

488 Senior Seminar (3-0) Cr 3 S *Prereq 356 366* Staff Topics selected by the instructor and vary each semester Written and oral presentations required

490 Independent Study Cr 2 to 4 each time taken *Prereq 6 credits in geology and permission of instructor No more than 9 credits of Geol 490 may be counted toward graduation*

Primarily for Graduate Students, major or minor, open to qualified undergraduates

505 Geology of Mineral Resources (Mn Rs 505) See *Mineral Resources*

506 Geology Field Trip Cr 2 each time taken May be taken more than once F S *Prereq Graduate classification* Staff Geology of selected regions studied by correlated readings followed by a field trip to points of geologic interest Ten-day field trip Required of all students in graduate degree programs Field trip fee

507 Mineral Resources Field Trip (Mn Rs 507) See *Mineral Resources*

510 Field Methods in Hydrogeology (0-4) Cr 2 SS Simpkins *Prereq 511* Survey of field methods used in groundwater investigations Pumping tests slug tests monitoring well installation drilling techniques geochemical sampling stream gaging geophysics Field trip to the Big Spring Basin in Northeast Iowa to examine karst hydrology Field trips materials fee

511 Hydrogeology (3 2) Cr 4 F *Prereq 475* Groundwater hydraulics and geochemistry the geology of aquifer types computer modeling and groundwater geophysics Emphasis on field and laboratory methods for hydrogeological *investigations* Field trip fee

512 Aqueous Geochemistry (2 2) Cr 3 Alt S offered 1994 *Prereq 475 Chem 164 or equivalent background in chemistry* Richardson Cody Processes affecting the chemistry of natural waters *with particular emphasis* on water rock interactions chemical weathering formation and characteristics of clay minerals Laboratory emphasizes the characterization of *clay minerals and analysis of* natural waters Materials fee

532 Geochemistry (3 0) Cr 3 Alt S offered 1995 *Prereq Credit or enrollment in 541 physical chemistry recommended* Richardson Thermodynamic and kinetic methods *for* interpreting geochemical processes and environments Emphasis on processes of interest to petrologists phase relations in binary systems kinetics of crystallization isotopic systematics hydrothermal systems planetary evolution Computer modeling

541 Mineral Chemistry and Physics (3-0) Cr 3 Alt F offered 1993 *Prereq 313* Windom Fundamentals of crystal chemistry and application to common rock forming minerals especially silicates Chemical bonding polyhedral packing crystallography mineral genesis and *metamorphism* physical properties of minerals

542 Optical Mineralogy (1 2) Cr 2 S *Prereq 313* Spry Introduction to using the microscope for mineral identification Optical properties of minerals in immersion oils and in thin section Materials fee

543 Microanalysis of Geologic Materials (1 3) Cr 2 F *Prereq 541 and permission of instructor* Staff Theory and operation of the electron microprobe with emphasis on the analysis of geologic materials Sample preparation data *acquisition and data correction* schemes utilizing both energy dispersive and wavelength dispersive x-ray detection systems Class size strictly limited to 12

550 Advanced Structural Geology (2 2) Cr 3 Alt S *offered 1994 Prereq 356* Jacobson Principles of stress and strain folding faulting development of schistosity and lineation deformation mechanisms and flow *laws* development and tectonic implications of crystallographic preferred orientations Lab includes descriptive geometry use of the stereonet and computer applications Materials fee

562 Igneous Petrology (2-2) Cr 3 Alt S offered 1994 *Prereq 532* Nordlie Windom Consideration of physical and chemical evidence of the origin and evolution of igneous rocks nature of crustal and mantle course regions physical properties of *magmas behavior* of major and minor trace elements during melting and crystallization processes Emphasis will be placed on modern theories of magmatic processes *Laboratory* involves microscopic examination of igneous rocks in thin section computer applications Materials computer fee

564 Metamorphic Petrology (2 2) Cr 3 Alt S offered 1995 *Prereq 541 532 Jacobson Mineral* assemblages and textures of contact dynamic and regionally metamorphosed rocks processes of recrystallization and deformation as functions of environmental conditions regional patterns of metamorphic belts Laboratory involves microscopic examination of metamorphic rocks in thin section computer applications Materials fee

571 Principles of Stratigraphy (3-0) Cr 3 Alt F offered 1994 *Prereq 412 471* Vondra Basic concepts in stratigraphy stratigraphic subdivision and nomenclature correlation facies and facies analysis sedimentary tectonics and basin analysis

***574 (474 DL) Glacial and Pleistocene Geology** (2 2) Cr 3 Alt S offered 1995 *Prereq 471* Depositional and erosional processes of glaciers and their effect on the landscape glaciology sea level change Quaternary stratigraphy and studies of modern *glacial analogs lab emphasizes* aerial photo interpretation and Midwestern Pleistocene stratigraphy Field trip fee

***575 (475 DL) Geomorphology** (2 2) Cr 3 Alt S offered 1994 *Prereq 471* Weathering erosion and sediment *production analysis of landforms* and processes in fluvial arid/semiarid glacial periglacial karst coastal and volcanic environments Field trip fee

576 Clastic Sedimentation (2 2) Cr 3 Alt S offered 1994 *Prereq 571 Vondra Interpretation* of clastic sedimentary rocks to infer processes environments and tectonic settings under which they formed Major clastic facies of selected regions studied and analyzed Field trips Materials fee

578 Chemical Sedimentation (2-2) Cr 3 Alt S offered 1995 *Prereq 511* Cody Survey of the origin and characteristics of recent and ancient chemical sediments clays carbonates phosphates zeolites and sulfates Materials fee

582 Economic Geology (2 1) Cr 3 Alt F offered 1993 *Prereq 366* Spry Major processes which concentrate economically important materials in the earth particularly the nature and origin of metallic ore deposits Geochemical conditions of ore formation using stable isotopes fluid inclusions and sulfide stability studies Laboratory emphasizes the study of economic minerals from metallic deposits *Materials fee*

590 Special Topics Cr 1 to 3 each time taken
- A Geomorphology
- B Stratigraphy
- C Sedimentation
- D Paleontology
- E Petrology
- F Structural Geology
- G Geochemistry
- H Water Resources
- I Earth Science
- J Mineral Resources
- K Geophysics
- L Mineralogy

595 Seminar Cr R F S *Prereq Senior or graduate classification* Weekly seminar on topics of current research interest All students in graduate degree programs must enroll during each semester in residence

599 Creative Component Cr var

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*See page 119 for information on dual listed (DL) courses

Courses for Graduate Students, major or minor

610 Seminar in Hydrogeology Cr 2 to 4 each time taken F S *Prereq 511 or 512*

640 Seminar in Earth Materials Cr 2 to 4 each time taken F S *Prereq 532 541 or 564*

650 Seminar in Geotectonics Cr 2 to 4 each time taken F S *Prereq 550*

660 Seminar in Sedimentation and Stratigraphy Cr 2 to 4 each time taken F S *Prereq 571 or 578*

670 Seminar in Surficial Geology Cr 2 to 4 each time taken F S *Prereq 575*

680 Seminar in Economic Geology Cr 2 to 4 each time taken F S *Prereq 581*

699 Research Cr var
A Geomorphology
B Stratigraphy
C Sedimentation
D Paleontology
E Petrology
F Structural Geology
G Geochemistry
H Water Resources
I Earth Science
J Mineral Resources
K Geophysics
L Mineralogy

Meteorology (Mteor)

Courses Primarily for Undergraduate Students

101 Technical Lectures (1-0) Cr R F An overview of the atmospheric sciences the meteorology program and general university procedures

206 Introduction to Meteorology (Agron 206) (3 0) Cr 2 or 3 F S Two-credit students will attend the first two thirds of the semester Introductory concepts in meteorology including atmospheric measurements radiation stability precipitation winds fronts forecasting and severe weather Three-credit students will cover the above plus selected topics in applied meteorology such as weather and transportation safety weather and agriculture and general world climates

301 General Meteorology I (3-0) Cr 3 S *Prereq Math 166 or 176 Phys 222* Global and vertical distribution of temperature wind and atmospheric constituents atmospheric thermodynamics radia tive transfer global energy balance storms and clouds

301L Weather Observations Laboratory (0 2) Cr 1 S *Prereq Credit or enrollment in 301* Cloud classification measurement of wind temperature pressure solar radiation visibility and humidity Materials fee

302 General Meteorology II (3-0) Cr 3 F *Prereq 301* Fluid processes in the atmosphere conservation laws for mass energy and momentum geostrophic and gradient flow vorticity and general circulation

302L Synoptic Laboratory I (0-3) Cr 1 F *Prereq 301 credit or enrollment in 302* Concepts of weather map plotting and analysis Introduction to forecasting and to the use of real-time UNIDATA computer products Materials fee

306 Use of Weather Data in Agriculture (Agron 306) See *Agronomy*

321 Cooperative Education in Meteorology Cr 1 or 2 each time taken maximum of 3 cr F S SS *Prereq 302 302L junior or senior standing permission of co-op program coordinator acceptance by sponsoring agency* Supervised practical experience in a professional meteorological agency Experiences may include providing weather information for radio TV utilities government agencies construction or agribusiness

341 Atmospheric Physics I (3-0) Cr 3 F *Prereq Phys 222 credit or enrollment in Math 266* Basic laws of thermodynamics thermodynamics of water vapor mixtures of gases stability hydrostatics cloud physics

342 Atmospheric Physics II (3-0) Cr 3 S *Prereq 341* Precipitation physics radar atmospheric radiation atmospheric optics atmospheric electricity

404 (504 DL) Global Climate Change (Agron 404/504 Env S 404) (3-0) Cr 3 S *Prereq Four courses in physical or biological sciences or engineering* Biogeochemical cycles ozone chemistry global energy balance structure and circulation of the atmosphere and oceans climate modeling climate variability implications for agriculture water resources energy use and public policy

406 Climates of the Continents (Agron 406) See *Agronomy*

443 Dynamic Meteorology I (3-0) Cr 3 S *Prereq 341* Conservation laws governing equations circulation and vorticity planetary boundary layer

454 Dynamic Meteorology II (3-0) Cr 3 F *Prereq 443* Development of quasigeostrophic theory Numerical prediction methods and linear perturbation theory Applications to midlatitude synoptic systems

454L Synoptic Laboratory II (0-4) Cr 2 F *Prereq Credit or enrollment in 454* Current weather forecasting and discussion Analysis exercises based on UNIDATA computer products to relate physical and dynamic theory to the structure and behavior of the midlatitude synoptic scale cyclone Materials fee

455 Dynamic Meteorology III (3-0) Cr 3 S *Prereq 454* Jets and frontogenesis synoptic-scale storm development severe weather survey of tropics and general circulation

455L Synoptic Laboratory III (0-6) Cr 2 S *Prereq Credit or enrollment in 455* Real time computer analysis of current weather Studies in jet stream and frontal structure development of surface pressure features severe weather Materials fee

490 Independent Study Cr 1 to 3 each time taken *Prereq 6 credits in meteorology permission of instructor No more than 9 credits in Mteor 490 may be counted toward graduation*
A Synoptic Meteorology
B Dynamic Meteorology
C Physical Meteorology

499 Seminar (1 0) Cr 1 F *Required of all senior meteorology majors* Research projects in collaboration with faculty Written and oral presentations of results at the end of the semester

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

504 (404 DL) Global Climate Change (Agron 504/404) (3 0) Cr 3 S *Prereq Four courses in physical or biological sciences or engineering* Biogeochemical cycles ozone chemistry global energy balance structure and circulation of the atmosphere and oceans climate modeling climate variability implications for agriculture water resources energy use and public policy

505 Microclimatology (Agron 505) See *Agronomy*

528 Atmospheric Physics (Phys 528) See *Physics*

542 Physical Meteorology (3-0) Cr 3 Alt F offered 1993 *Prereq 342 Math 266 Phys 222* Planetary atmospheres radiative equilibrium models radiative transfer the upper atmosphere remote sounding from satellites

543 544 Advanced Dynamic Meteorology I, II (3-0) Cr 3 Alt yr offered 1994 95 *Prereq 543 455 544 543* 543 Governing equations scale analysis simple types of wave motion in the atmosphere instability theory 544 General circulation and dynamics of zonally symmetric circulations atmospheric energetics nonlinear dynamics of planetary waves

561 Geophysical Fluid Dynamics (3-0) Cr 3 Alt F offered 1993 *Prereq 455 or E M 378 or M E 335 or Phys 361* Basic concept of rotating fluid dynamics governing equations and boundary conditions dynamics of vorticity potential vorticity and geostrophic motion wave motion in a rotating system dynamics of Ekman and Stewartson layers ocean circulation

571 Cloud Physics (3-0) Cr 3 Alt S offered 1995 *Prereq 342 or Phys 304* Thermodynamics of phase change and nucleation condensation nuclei and ice nuclei diffusional growth of cloud drops and ice crystals accretional growth of cloud drops and ice particles precipitation physics

590 Special Topics Cr 1 to 3 each time taken *Prereq Permission of instructor* Topics of current interest
A Boundary layer Meteorology
B Tropical Meteorology
C Mesoscale Meteorology
D Global Climate Systems
E Climate Modeling
F Numerical Weather Prediction
G Satellite Observations
H Statistical Methods in Meteorology
I Field Observations
J Low Frequency Modes

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*See page 119 for information on dual listed courses

Courses for Graduate Students, major or minor

605 Micrometeorology (3-0) Cr 3 Alt F offered 1993 *Prereq 443* Atmospheric boundary layer structure and dynamics Turbulence soil influences measurements and empirical relations for wind and temperature profiles near the ground Simulation of boundary layer structure and dynamics

641 Atmospheric Radiation (3 0) Cr 3 Alt F offered 1993 *Prereq Math 266* Solar and terrestrial radiation radiative transfer equation Stokes parameters polarization

699 Research Cr var

Courses Offered at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi

Written permission of the coordinator for the Gulf Coast Research Laboratory 201 Bessey Hall Iowa State University Ames, Iowa 50011 is prerequisite to all courses offered at the Gulf Coast Laboratory Numbers in parentheses beginning with MAR are GCRL numbers

222G (MAR 300 300L) Oceanography (3-4) Cr 5 SS *Prereq College algebra Chem 164 Biol 202* An integration of physical chemical biological and general oceanography to provide a multidisciplinary approach to the discipline

424G (MAR 482 482L) Coastal Marine Geology (2-2) Cr 3 SS *Prereq 6 credits in geology* In shore and near shore geological processes sedimentation patterns and landform development

Gerontology

(Interdepartmental Minor)

Supervisory Committee P A Martin, Coordinator M A Atkins, W J Goudy J M Huston J M Mercier P C Morrow M J Oakland A E Osterberg

The gerontology program is designed for students desiring careers in aging-related fields and for students interested in improving their understanding of the aged in American society Students are expected to take courses to develop the necessary interdisciplinary breadth which in combination with other disciplinary training can prepare them to work with the aged

Work is offered for the interdepartmental gerontology program with the following departments participating Architecture Biochemistry and Biophysics Economics, Family and Consumer Sciences Education and Studies Food Science and Human Nutrition Health and Human Performance Human Development and Family Studies Political Science Professional Studies in Education (Adult Education), Psychology Sociology Speech Communication and Textiles and Clothing

Undergraduate Study

M Atkins, Coordinator

Undergraduate study in this program provides the student with an opportunity to develop a minor in gerontology It involves a balanced grouping of courses to help the student develop both a sensitivity to the issues and the ability to synthesize ideas from the variety of disciplines important to the aging process

Current gerontology courses are listed below Undergraduate students may minor in gerontology by taking 16 semester hours of gerontology related courses Nine of these credits must come from the following courses Geron 321 377 448 461 476 The student will participate in a prepracticum seminar Geron 466 and will complete a supervised field practicum after all gerontology coursework is completed (Geron 467) A minimum of 3 semester credits must come from a list of supportive gerontology related courses Supportive courses include units or topics related to aging and can be used to complement the student's major interests The student s minor program must be approved by the undergraduate gerontology coordinator

Courses Primarily for Undergraduate Students

321 Communication with Elderly (Sp Cm 321) *See Speech Communication*

377 Aging and the Family (HD FS 377) See *Human Development and Family Studies*

448 Economics of Aging (Econ 448 HD FS 448) See *Economics Human Development and Family Studies*

461 Life Course Sociology (Soc 461) (So Wk 461) See *Sociology Social Work*

465 Physical Activity and Aging (P E 465) See *Physical Education*

466 Gerontology Prepracticum Seminar (U St 466) (1-0) Cr 1 F *Prereq 9 credits in core courses for the gerontology minor and approval of the gerontology undergraduate coordinator* Prepracticum training for students planning a gerontology practicum Exploration of possible agencies for the practicum in-depth study of a selected agency and development of goals and objectives for the practicum

467 Gerontology Practicum *(U St 467) Cr 3 to 6 S Prereq 466 advance reservation* Supervised field experience related to aging Offered on a satisfactory fail basis only

476 The Aged in American Society (Soc 476) See *Sociology*

Graduate Study

A E Osterberg, Coordinator

A declared graduate minor in gerontology consists of a minimum of 12 credits taken from a list of acceptable courses and from at least two departments Nine of these 12 credits will be in courses focused specifically on aging At least one member of the gerontology forum will be on a student s advisory committee this person must be at least an associate member of the Graduate Faculty for a master's committee and a full member for a doctoral committee Because gerontology is a rapidly developing area departments participating in the minor and specific course offerings may change in the future Contact the coordinator to determine whether courses other than those listed below are available

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

431 Psychology of Maturity and Old Age (Psych 431) See *Psychology*

448 Economics of Aging (Econ 448) (HD FS 448) See *Economics Human Development and Family Studies*

463 Designing Spaces for the Disabled (HD FS 463) (ArtID 463) See *Human Development and Family Studies Art and Design Interior Design*

465 Physical Activity and Aging (P E 465) See *Physical Education*

561 Life Course Research (Soc 561) See *Sociology*

566 Housing for Specific Groups (Arch 566) See *Architecture*

576 Sociological Perspectives on Aging (Soc 576) See *Sociology*

577 Aging and Intergenerational Relations (HD FS 577) See *Human Development and Family Studies*

Health and Human Performance

Shirley Jean Wood Chair of Department

Professors Anderson Mathes Pease

Emeritus Professors Forker Frye Hutchinson Nichols Schneider Toman

Associate Professors Conover Cooney Engelhorn Gray Kiyoguchi Sharp Wood York

Assistant Professors Baker Bergan, Colbry Duitsman Franke King McDonald Murdoch Orr Rauschenbach Robertson Sanda Schabel Storer Symons Tant

Instructors D Anderson L Anderson Cychosz Deeter Greenlee Harklau Hedrick Henrich Immel Krafcisin Kuhn Lee Lynn McEachran Mickelson Pak Power B Randall C Randall Rayl Smith Stephens Van Horn

Undergraduate Study

Health Studies For undergraduate curriculum in community health education leading to the degree of bachelor of science, see *College of Education Curricula* The community health education program is designed to prepare students for professional involvement in programs which incorporate health services and the educational process Typical employment settings include city county regional and state health departments hospitals and clinics voluntary organizations and private businesses which focus on health promotion or offer health education as a benefit to employees

Students interested in teaching may qualify to teach health education (see *Teacher Education Requirements for Areas of Specialization*)

Introductory courses in health studies offer opportunities for learning experiences in personal and community health drug education and emergency health care

The department offers a minor in health studies which may be earned by completing the following H S 105 110 215 310 350, 430 or 440 and three additional credits selected from HS 390 HD FS 373 377 FS HN 167 Psych 360 O Saf 470 Zool 258

Dance Coursework in dance provides opportunities for students to develop an understanding and appreciation of dance as part of a liberal education Those interested in teaching dance and physical education in the public schools may major in physical education and minor in dance An individualized program in dance is also available through the Department of Health and Human Performance

The department offers a minor in dance which may be earned by completing the following Dance 220 222 270 320 360 384 or 386 and three additional credits selected from dance courses numbered 200 or above Credit for both Dance 385 and 386 may not be applied toward a dance minor *Participation in Orchesis I or II is recommended*

Physical Education For undergraduate curriculum in physical education leading to the degree bachelor of science see *College of Education Curricula* The curriculum in physical education has three facets the general education component the human movement core and a specialization option The following options are available a licensure (7-12) b licensure (K-6 7-12) c exercise science d athletic training e sport management and f general physical education studies

The secondary licensure (7-12) option provides a program of studies for students who wish to become licensed to teach physical education in the secondary schools An additional licensure option is provided for students who wish to become authorized to teach physical education in kindergarten and grades one through twelve For those students interested in coaching additional competence may be obtained through selection of appropriate electives To be accepted into the teacher education program students must be approved by the departmental committee and the College of Education Teacher Education Committee Consideration of admission into the Department Teacher Education Program requires completion of PE 250, 255 258 SecEd 204 280 and 12 credits in general education coursework Admission requires a grade point of 2 3 Details are available from the department advising office

Several options are planned for students who are interested in the study of human movement as preparation for professional roles other than public school teaching The exercise science option leads toward professional roles as directors and leaders in

the fitness field in corporate recreational clinical or institutional settings The athletic training option prepares students for the NATA certification examination or for graduate work in athletic training See *Physical Education Curriculum* in the College of Education section for information on minimum grade requirements in core courses The sport management option serves students seeking to prepare for entry-level positions as sports specialists in public and private agencies involving sports instruction recreational sports and sport management The general physical education studies option is designed to allow students to take coursework outside the department to support and enhance an individualized program in such areas as sport psychology sports information and promotion pre-physical therapy and other allied health and sport-related fields

The department offers minors in athletic training and in athletic coaching The athletic training minor may be earned by completing the following P E 225 325 355 455 488 H S 110 215 FS HN 167 and a minimum of two credits selected from courses numbered 301-311

The athletic coaching minor may be earned by completing the following P E 220 258 355 365 402 455 485 or 486 Zool 155 156 Psych 230 and a minimum of two credits selected from P E courses numbered 301-311

Endorsement to Coach Interscholastic Athletics The State Department of Education has provided for the endorsement of licensed teachers for the coaching of athletic teams in schools The endorsement does *not* lead to licensure to teach physical education For requirements of the program leading to the coaching endorsement, see *Teacher Education Requirements for Areas of Specialization*

Basic Activity Instruction Program The department offers a wide selection of beginning intermediate and advanced courses in the areas of aquatics dance and sports These courses are designed to serve general education purposes for all students

Graduate Study

The department offers work for the degree master of science with major in physical education and minor work to students taking major work in other departments

The normal prerequisite to major graduate work is the satisfactory completion of a curriculum essentially equivalent to that required of undergraduate students in physical education at this university However it is possible for students to qualify for graduate study even though undergraduate preparation has been in a related area

A student in the graduate program may select either a thesis or nonthesis option Specific information about the requirements for either degree option is available from the departmental office

The department participates in the interdepartmental minor in gerontology (see *Index*)

Courses open to graduate students for minor credit only P E 355 393 455 465 475

Courses Primarily for Undergraduate Students

Athletics (Ath)

***101 Intercollegiate Athletics** Cr 1 in any one semester Limited to 1 credit per year to a maximum of 4 F S *Prereq Permission of head coach* Offered on a satisfactory/fail basis only

A Baseball (men)
B Basketball (men)
C Basketball (women)
D Cross Country (men)
E Cross Country (women)
F Football (men)
G Golf (men)
I Gymnastics (men)
J Gymnastics (women)
K Softball (women)
L Swimming/Diving (men)
M Swimming/Diving (women)
N Tennis (men)
O Tennis (women)
P Track and Field (men)
Q Track and Field (women)
R Volleyball (women)
S Wrestling (men)
T Golf (women)

*Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for PE 166 or 167 or any skill technique course in the same sport

Health Studies (H S)

105 First Aid and Emergency Care (1 2) Cr 2 F S Discussion and application of the basic techniques of administering first aid and cardiopulmonary resuscitation ARC certification available Materials fee

110 Personal and Consumer Health (3-0) Cr 3 F S Physical mental and social aspects of health as a basis for understanding and preventing health problems False and misleading advertising and effects of cultists and fadists on consumer health Study of legislation and agencies concerned with consumer protection and health insurance

215 Drug Education (3-0) Cr 3 *Prereq Psych 101 or 230* Use and abuse of mood modifying substances in contemporary society Includes study of tobacco alcohol and other drugs

***275 Health Education in the Elementary School** (3-0) Cr 3 *Prereq HD FS 129 or 226* An overview of school health services healthful school living and health instruction for teachers at the elementary level

292 Acquired Immune Deficiency Syndrome and Sexually Transmitted Diseases (3-0) Cr 3 SS An introductory nontechnical examination of the biological social psychological and ethical aspects of AIDS and sexually transmitted diseases

294 Health Issues for Women (3-0) Cr 3 SS Examines health and health care issues related to women

305 Instructor s First Aid and Cardiopulmonary Resuscitation (1 2) Cr 2 *Prereq 105 current Standard First Aid and Community CPR Certification* Discussion and practice of skills needed to teach first aid and cardiopulmonary resuscitation ARC certification available

310 Community and Public Health (3-0) Cr 3 *Prereq 110* Introduction to community health problems programs of prevention environmental health agencies and health services Study of local state and national community health agencies their purposes and functions

350 Human Diseases (3 0) Cr 3 *Prereq 110* Discussion of disease process and ill health in the twentieth century Emphasis on epidemiology prevention treatment and the understanding of the etiology of communicable and noncommunicable diseases

***375 Teaching-Learning Process in Health Education** (3 0) Cr 3 *Prereq 105 110 215* Principles methods materials and resources involved in the teaching of health Includes organization and development of the health education curriculum (K 12)

390 Administration of the School Health Program (3 0) Cr 3 *Prereq 310 375* History and legal basis of school health programs Procedure for developing organizing administering and evaluating a modern program of health services healthful school living and health instruction Includes school community relationships

417 Supervised Teaching in Health Education in the Secondary School Cr var F S *Prereq 375 Advance registration required* Offered on a satisfactory fail basis only

418 Supervised Teaching in Health Education in the Elementary School Cr var F S *Prereq 375 Advance registration required* Offered on a satisfactory fail basis only

430 Community Health Program Development (3 0) Cr 3 *Prereq 310* Techniques of needs assessment program design administration and evaluation for the development of a community health education program in various settings

440 Health Promotion in the Community and Workplace (2 2) Cr 3 *Prereq 310 FS HN 167 Psych 101* Survey of health promotion programs in community and workspace settings Organization implementation and administration of wellness programs such as weight loss smoking cessation cholesterol reduction and stress management Fee for field trips

488 Directed Field Experience in Health Education Cr var maximum of 12 *Prereq 310 advance registration required* Supervised experience in health education Offered on a satisfactory-fail basis only

490 Independent Study Cr 1 to 6 maximum of 6 S *Prereq 6 credits in health studies and permission of coordinator*

*Credit for both 275 and 375 may not be applied toward graduation

Dance (Dance)

120 Modern Dance I (0-3) Cr 1 F S Introduction and practice of basic dance concepts including preparatory techniques and guided creativity problems No previous modern dance experience required Offered on a satisfactory fail basis only

130 Ballet I (0-3) Cr 1 F S Introduction to the basic skills vocabulary and tradition of ballet with concentration on control and proper alignment No previous ballet experience required Offered on a satisfactory fail basis only

140 Jazz I (0 3) Cr 1 F S Introduction to the modern jazz style with concentration on isolation and syncopation No previous jazz experience required Offered on a satisfactory fail basis only

150 Tap Dance I (0 3) Cr 1 Instruction and practice in basic tap technique and terminology No previous tap experience required Offered on a satisfactor- fail basis only

160 Ballroom Dance I (0-2) Cr 1 F S Instruction and practice in foxtrot waltz swing cha cha rhumba tango and selected contemporary dances Offered on a satisfactor fail basis only

170 Folk and Square Dance (0 2) Cr 1 F S Instruction and practice in various international folk dances and American square dance Offered on a satisfactory fail basis only

199 Dance Continuum Cr 0 5 to 2 each time taken maximum of 6 credits F S *Prereq Permission of instructor advance registration required* Continued instruction and practice in either modern dance recreational dance ballet jazz and/or compositional skills Offered on a satisfactory fail basis only

210 Aspects of Rhythmic Movement and Dance(0-3) Cr 1 F S Survey and practice of the

relation of rhythm to movement activities and basic dance concepts Emphasis on methods of teaching rhythm Physical education majors or by permission of instructor

211 Fundamentals of Folk Square and Social Dance (0 3) Cr 1 Skill enhancement understanding and progressions Designed for physical education majors open to others

220 Modern Dance Composition (1-3) Cr 2 S *Prereq 120 or previous modern dance experience* Theory and practice of the creative skills involved in solo and small group composition

222 Modern Dance II (0-3) Cr 1 F S *Prereq 120 or previous modern dance experience* Dance techniques emphasizing strength balance endurance rhythmic activity and extended combinations

223 Modern Dance III (0 3) Cr 1 F S *Prereq 222* Continued experience in dance techniques and extended combinations Emphasis on maturation of skill and artistry Exposure to a variety of modern dance technical styles

224 Concert and Theatre Dance *(0 3) Cr 0 5 to 2* maximum of 6 credits F S *Prereq By audition only* Choreography rehearsal and performance in campus dance *concerts and/or musical theatre* productions Offered on a satisfactory fail basis only

232 Ballet II (0 3) Cr 1 F S *Prereq Previous ballet experience* Technical skills in the classical movement vocabulary Emphasis on alignment techniques sequence development and performing quality

233 Ballet III (0 3) Cr 1 *Prereq 232* Concentration on technical proficiency at the intermediate level Pointe work and partnering opportunities available

242 Jazz II *(0-3) Cr 1 Prereq Previous jazz dance experience* Dance concepts within the jazz idiom Instruction in extended movement sequences and *artistic interpretation*

243 Jazz III (0 3) Cr 1 *Prereq 242* Integration of the concepts of jazz dynamics phrasing and skills into performance situations Some repertory work of historical and contemporary pieces

262 Ballroom Dance II (0-2) Cr 1 *Prereq Previous ballroom dance experience* Practice in ballroom dance routines Emphasis on style posture and footwork Defining technique and execution Leading and following more defined

270 Dance Appreciation (2-0) Cr 2 F *Introduction to dance as an art form* emphasizing abilities to analyze and appreciate various dance styles No dance experience required

320 Sound and Movement (2 2) Cr 3 Alt S offered 1995 *Prereq 220* Intermediate composition based on the relationship of movement to improvised sounds rhythmic scores and the musical works of composers from various periods

360 History and Philosophy of Dance (3-0) Cr 3 Alt F offered 1994 *Prereq 270* Study of the history of dance from early to modern times with emphasis on the theories and philosophies of contemporary modern dance dancers and dance educators

370 Advanced Studies in Dance Cr 1 to 3 in any one semester to a maximum of 8 credits F S *Prereq 2 credits in dance Advance registration required* Designed to meet special interests and talents of students to include both group and independent study in various aspects of dance as a performing art including production choreography and performance

384 Teaching Children s Dance (1 3) Cr 2 S *Prereq 210 P E 275 Content* experiences and methods of a comprehensive dance program at the elementary school level Theories and practice in guiding elementary school children in expressive movement experiences

385 Methods of Teaching Dance (1-3) Cr 2 F *Prereq 210 211* Methods and techniques of teaching recreational dance forms Introduction to teaching educational modern dance

386 Teaching Dance Technique and Composition (1-3) Cr 2 Alt F offered 1993 *Prereq 320* Teaching of dance as an expressive art form with emphasis on technique *rhythm and the* creative teaching process

490 Independent Study Cr 1 to 6 maximum of 6 *Prereq 6 credits in dance and permission of coordinator* Independent study of problems or areas of interest in dance

Physical Education (P E)

101 Swimming I *(0-3) Cr 1 F S Basic course for* nonswimmers Emphasis on two fundamental strokes and personal water safety skills Materials *fee Offered on a satisfactory fail basis only*

102 Swimming II (0 3) Cr 1 F S *Prereq 101 or equivalent skill* Intermediate course Emphasis on learning and improving five basic strokes and personal water safety skills Materials fee Offered on a satisfactory-fail basis only

103 Swimming III (0-3) Cr 1 F S *Prereq 102 or equivalent skill* Advanced course Emphasis on ten swimming strokes and personal water safety skills Improved efficiency on each stroke Materials fee Offered on a satisfactory fail basis only

105 Springboard Diving *(0 3) Cr 1 F S Prereq 102 or equivalent skill* Materials fee Offered on a satisfactory fail basis only

108 Aquatic Fitness (0-3) Cr 1 *Prereq 102 or equivalent skill* Water related exercises activities and swimming workouts to improve physical fitness Materials fee Offered on a satisfactory fail basis only

109 Basic Skin and Scuba Diving (1 3) Cr 2 F S *Prereq Swimming competence* Materials fee Offered on a satisfactory fail basis only

113 Scuba Assistant Instructor Practicum (0 2) Cr 1 *Prereq 109* Supervised experience in conduct of basic scuba diving program Offered on a *satisfactory fail basis only*

114 Lifeguard Training (0-3) Cr 1 F S *Prereq Ability to swim 500 yards continuously of front crawl sidestroke and breaststroke perform a standing and surface dive swim under water and tread water for one minute Minimum age 16* Specific training for Red Cross Lifeguard certification First aid and CPR included Materials fee Offered on a satisfactory-fail basis only

115 WSI and Lifeguard Training Instructor (0-5) Cr 1 F S *Prereq Minimum age 17 current lifeguard first aid and CPR certifications* Stroke analysis and methods of class organization and instruction of swimming water safety and rescue skills Red Cross Water Safety Instructor and Lifeguarding Instructor certifications

116 Water Safety Instructor Practicum (0 3) Cr 1 *Prereq 115 HS 105 CPR certification and permission of instructor* Supervised teaching experience in swimming aquatic fitness lifeguard training and WSI courses

119 Archery I (0 2) Cr 1 F S Materials fee Offered on a satisfactory fail basis only

122 Badminton I (0 2) Cr 1 F S Offered on a satisfactory fail basis only

123 Badminton II (0 2) Cr 1 F S *Prereq 122* Offered on a satisfactory fail basis only

126 Pocket Billiards I (0-2) Cr 1 F S Introduction to the basic strokes (stop draw follow) and contemporary game forms associated with pocket billiards Materials fee Offered on a satisfactory fail basis only

127 Pocket Billiards II (0 2) Cr 1 F S *Prereq 126* Use of basic strokes in more advanced game forms Materials fee Offered on a satisfactory-fail basis only

129 Bowling I (0-2) Cr 1 F S Materials fee Offered on a satisfactory fail basis only

130 Bowling II (0-2) Cr 1 F S *Prereq 129* Materials fee Offered on a satisfactory fail basis only

132 Fencing (0 2) Cr 1 F S *Offered on a* satisfactory-fail basis only

135 Golf I (0-2) Cr 1 F S Beginning skills only Materials fee Offered on a satisfactory fail basis only

136 Golf II (0 2) Cr 1 F S *Prereq 135 or equivalent skill* Materials fee Offered on a satisfactory fail basis only

137 Golf III (0-2) Cr 1 F S *Prereq 136* Emphasis on individual error correction and practice in the advanced skills of golf Study of comprehensive rules which apply to competitive play *Materials fee* Offered on a satisfactory fail basis only

139 Gymnastics I (0-2) Cr 1 F S Offered on a satisfactory fail basis only

140 Gymnastics II (0 2) Cr 1 F S *Prereq 139 or equivalent skill* Offered on a satisfactory fail basis only

144 Racquetball I (0 2) Cr 1 F S Materials fee Offered on a satisfactory fail basis only

145 Racquetball II (0 2) Cr 1 F S *Prereq 144 or equivalent skill* Materials fee Offered on a satisfactory fail basis only

151 Cross Country Skiing (0-2) Cr 1 S Materials fee *Offered on a satisfactory fail basis only*

153 Ice and Figure Skating (0-2) Cr 1 S Materials fee Offered on a satisfactory fail basis only

158 Tennis I (0-2) Cr 1 F S SS Introduction to basic skills (forehand backhand service) and basic knowledge of game play Materials fee Offered on a satisfactory fail basis only

159 Tennis II (0 2) Cr 1 F S SS *Prereq 158* Expansion of basic skills to include volley and spins Introduction to basic strategy Materials fee Offered *on a satisfactory fail basis only*

160 Tennis III (0-2) Cr 1 F S *Prereq 159* Introduction to more advanced skills (lob overhead and spin serves) Materials fee Offered on a satisfactory fail basis only

161 Tennis IV (0 2) Cr 1 F S *Prereq 160* Instruction and practice in the more advanced skills of tennis Emphasis on the use of these skills and strategy employed in effective singles and doubles play Materials fee Offered on a satisfactory fail basis only

†163 Physical Fitness *(0 3) Cr 1 F S* Evaluation of fitness status Exercises activities and programs to improve physical fitness Relationship between physical activity and weight control Offered on a satisfactory fail basis only Credit for either 163 or 258 but not both may be applied toward graduation

164 Walking for Fitness (0 3) Cr 1 F S Fitness walking as an activity to improve health and fitness values of this type of activity as a lifetime endeavor Offered on a satisfactory fail basis only

165 Aerobic Dance and Exercise (0 3) Cr 1 Exercise class designed to improve fitness incorporating exercise to music along with various dance styles Offered on a satisfactory fail basis only

166 Weight Training I (0-3) Cr 1 F S Materials fee Offered on a satisfactory-fail basis only

167 Weight Training II (0 3) Cr 1 F S *Prereq 166* Materials fee Offered on a satisfactory fail basis only

168 Judo I (0-2) Cr 1 F S Offered on a satisfactory-fail basis only

169 Judo II (0 2) Cr 1 F S *Prereq 168* Offered on a satisfactory fail basis only

170 Tae Kwon Do/Karate I (0 2) Cr 1 F S Materials fee Offered on a satisfactory fail basis only

171 Tae Kwon Do/Karate II (0 2) Cr 1 *Prereq 170* Materials fee Offered on a satisfactory fail basis only

173 Hap Ki Do/Martial Self Defense (0-2) Cr 1 F S Offered on a satisfactory fail basis only

174 Wrestling (0-2) Cr 1 F Offered on a satisfactory fail basis only

175 Bicycling (0 2) Cr 1 Offered on a satisfactory fail basis only

176 Camping Skills and Techniques (0 2) Cr 1 F S Skills in outdoor cookery firebuilding and orienteering Study of equipment weather influences protection of natural resources and the use of native materials Materials fee Offered on a satisfactory fail basis only

178 Basketball (0 2) Cr 1 Offered on a satisfactory fail basis only

179 Flag Football (0 2) Cr 1 F S Offered on a satisfactory fail basis only

180 Softball I (0-2) Cr 1 F S Offered on a satisfactory fail basis only

182 Volleyball I (0-2) Cr 1 F S Offered on a satisfactory fail basis only

183 Volleyball II (0-2) Cr 1 S *Prereq 182 or equivalent skill* Offered on a satisfactory fail basis only

185 Soccer (0 2) Cr 1 F Offered on a satisfactory fail basis only

201 Techniques of Baseball (0-3) Cr 1 Fundamentals of pitching catching batting baserunning infield and outfield play Designed for the student seeking the coaching endorsement

202 Techniques of Basketball (0-3) Cr 1 Fundamentals of basket shooting passing ball handling and footwork Various defensive and offensive patterns Designed for the student seeking the coaching endorsement

203 Techniques of Football (0 3) Cr 1 Fundamentals of offensive and defensive line and backfield play forward passing and kicking skills Designed for the student seeking the coaching endorsement

209 Techniques of Track and Field (0-3) Cr 1 Fundamentals of various track and field events included in most high school programs Designed for the student seeking the coaching endorsement

215 Officiating Baseball/Softball (0-3) Cr 1 S Rules rules interpretation techniques and mechanics of officiating baseball and softball Practical experience gained through officiating in the intramural program

216 Officiating Basketball (0 3) Cr 1 F S Rules rules interpretation techniques and mechanics of officiating men s and women s basketball Practical experience gained through officiating in the intramural program

217 Officiating Football (0 3) Cr 1 F Rules rules interpretation techniques and mechanics of officiating football Practical experience gained through officiating in the intramural program

218 Officiating Volleyball (0-3) Cr 1 Rules rules interpretation techniques and mechanics of officiating volleyball Practical experience gained through officiating in the intramural program

219 Officiating Wrestling (0-3) Cr 1 Alt F offered 1994 Rules rules interpretation techniques and mechanics of officiating wrestling Practical experience gained through officiating in the intramural program

†220 Basic Athletic Training (1 2) Cr 2 *Prereq Zool 155 156* Introduction to methods of prevention and immediate care of athletic injuries Basic information concerning health supervision of athletes and some basic wrapping and strapping techniques for common injuries Materials fee

224 Modalities and Rehabilitation of Athletic Injuries (3 3) Cr 4 F *Prereq 220 258 admission to the physical education athletic training option or enrollment in a preprofessional health program and permission of instructor* Management of athletic injuries including athletic training modalities and rehabilitation Materials fee

228 Exercise and Nutrition for Lifetime Wellness (FS HN 228) (3 0) Cr 3 F S Principles of exercise and nutrition that provide a basis of information for life long wellness Open to nonmajors only

230 Fundamentals of Aquatics (0-3) Cr 1 *Prereq 101 or equivalent skill* Basic water safety and emergency water safety Skill enhancement understanding and progressions Designed for physical education majors open to others

231 Fundamentals of Tumbling and Gymnastics Skills (0 3) Cr 1 Fundamentals of tumbling and apparatus including teaching techniques and safety for the K 12 student Skill enhancement understanding and progressions Designed for physical education majors open to others

232 Fundamentals of Soccer Speedball and Volleyball (0-3) Cr 1 Skill enhancement understanding and progressions Designed for physical education majors open to others

233 Fundamentals of Softball and Basketball (0 3) Cr 1 Skill enhancement understanding and progressions Designed for physical education majors open to others

234 Fundamentals of Flag Football and Recreational Games (0-3) Cr 1 Fundamentals of flag football floor hockey recreational and cooperative games Skill enhancement understanding and progressions Designed for physical education majors open to others

235 Fundamentals of Tennis and Badminton (0 3) Cr 1 Skill enhancement understanding and progressions Designed for physical education majors open to others Materials fee

236 Fundamentals of Golf Archery, and Bowling (0-3) Cr 1 Skill enhancement understanding and progressions Designed for physical education majors open to others Materials fee

237 Fundamentals of Track and Field and Self Defense (0 3) Cr 1 Skill enhancement understanding and progressions Designed for physical education majors open to others

250 Physical Education Orientation (1-0) Cr R F S Orientation to various aspects of physical education and assistance in learning how to use facilities of the university and department Offered on a satisfactory fail basis only

255 Perspectives of Physical Education (0-2) Cr 1 F S Nature and scope of physical education as a profession Physical education majors only

†258 Physical Fitness and Conditioning (1 3) Cr 2 F S Development of personal fitness using a variety of conditioning and exercise techniques such as aerobics weight training and aquatic fitness Introduction to acute and chronic responses to exercise and the role of exercise in health promotion and weight management Physical education majors only Credit for either 163 or 258 but not both may be applied toward graduation

259 Leadership Techniques for Fitness Programs (1 3) Cr 2 F S *Prereq 258* Development of exercise leadership skills for a variety of activities Includes planning promotion and teaching techniques for developing fitness in others using a variety of exercise modalities including aerobics weight training and aquatic fitness

260 History and Philosophy of Physical Education and Sport (3-0) Cr 3 F S *Prereq 255 Development of sport and physical education in the United States and selected other societies*

†275 Movement Education in Elementary School Physical Education (2 2) Cr 3 F *Prereq HD FS 226* Study of movement experiences appropriate for the primary and intermediate grade child Focuses upon activities that develop physical and motor fitness and awareness of the self in relation to the environment and others Designed for physical education majors

280 Directed Field Experience in Elementary School Physical Education (0-3) Cr 1 S *Prereq 275* Observing planning and facilitating movement experiences of children in an elementary school setting

†284 Elementary and Pre school Movement Education (2 3) Cr 3 F S *Prereq 3 credits in human development and family studies* Approaches to teaching movement skills to pre school and elementary school age children Emphasis on planning appropriate learning environments to help children develop perceptual motor and fundamental movement skills as well as a positive self concept Practical experience provided through participation in a children s movement education laboratory

301 Coaching Baseball (1 3) Cr 2 *Prereq 201 or equivalent skill junior classification*

302 Coaching Basketball (1-3) Cr 2 S *Prereq 202 or equivalent skill junior classification*

303 Coaching Football (1 3) Cr 2 *Prereq 203 or equivalent skill junior classification*

304 Coaching Golf (1-3) Cr 2 Alt S offered 1992 *Prereq 136 or equivalent skill junior classification*

306 Coaching Softball (1 3) Cr 2 *Prereq 180 or equivalent skill junior classification*

307 Coaching Swimming (1 3) Cr 2 Alt F offered 1992 *Prereq 103 or equivalent skill junior classification*

308 Coaching Tennis (1 3) Cr 2 Alt S offered 1993 *Prereq 160 or equivalent skill level junior classification*

309 Coaching Track and Field (1-3) Cr 2 *Prereq 209 or equivalent skill junior classification*

310 Coaching Volleyball (1 3) Cr 2 *Prereq 183 or equivalent skill junior classification*

311 Coaching Wrestling (1-3) Cr 2 Alt F offered 1991 *Prereq 174 or equivalent skill junior classification*

325 Evaluation of Athletic Injuries (3 3) Cr 4 S *Prereq 220 258 credit or registration in 355 H S105 admission to the physical education athletic training option or enrollment in a preprofessional health program and permission of instructor* Procedures and tests used to evaluate athletic injuries including upper body lower body and emergency situations Materials fee

340 Management in the Sport Enterprise (3-0) Cr 3 *Prereq Econ 201 or 205 and 206* Basic management principles essential for the operation of sport related organizations Administrative areas of leadership personnel facilities financial control public relations marketing computer applications policy development and liability

350 Developing and Marketing Recreation Programs (2-4) Cr 4 *Prereq 340* Principles and practices in park and recreation leadership program development services and community organization for leisure Fee for field trips

352 Operation of Recreation Areas and Facilities (3 0) Cr 3 *Prereq 340* Operational factors associated with common recreation areas and facilities Exposure to capital development financing and feasibility studies Fee for field trips

355 Biomechanics (3 3) Cr 4 F S *Prereq Zool 155 156 Phys 101 or 106 or 111* The study of anatomical and mechanical phenomena which underlie human motion Includes the application of biomechanical concepts to a wide variety of exercise fundamental movement sport and physical activities

360 Sociology of Sport and Physical Activity (3-0) Cr 3 F S *Prereq 255 Soc 134* Sport as a social system and as an institution related to other institutions such as the polity the economy the mass media and education

365 Psychology of Sport and Physical Activity (3-0) Cr 3 F S *Prereq 255 Psych 101* Psychological factors that influence performance in a movement setting Analysis of the role of motivation and stress remediating techniques in relation to sport and physical activity

372 Motor Learning and Control (2 2) Cr 3 F S *Prereq Psych 101* Emphasis on the learning and control of skilled movement

375 Teaching Physical Education (2 3) Cr 3 S *Prereq 372 credit or registration in SecEd 301 admission to Teacher Education Program* Principles and current practices of teaching physical education Required practicum to be arranged

***393 Physical Education for the Disabled** (2 3) Cr 3 S *Prereq Psych 230* Specific disabling conditions in terms of etiology and prevalence with emphasis on motor characteristics movement potential and need Adaptation of activities methods and program planning Laboratory experience required

†*395 (595 DL) Adapted Physical Education (2 3) Cr 3 F *Prereq 375* Specific disabling conditions in terms of etiology characteristics needs and potential for movement experiences Techniques of assessment prescription adaptation of activities *methods and program planning* Laboratory experience required Physical education majors only

401 Job Search Skills and Strategies (1-0) Cr R *Prereq Senior classification* Job search techniques *and preparation of related materials Resources* specifically related to employment in the physical education and leisure studies fields

†402 Administrative Issues in Interscholastic Athletics (2 0) Cr 2 *Prereq Psych 230 2 credits from courses numbered 301-311* Current problems and issues in interscholastic athletics Emphasis on administrative and philosophical concerns

***410 (510 DL) Medical Aspects of Exercise** (2-0) Cr 2 *Prereq 455* The role of exercise in preventive medicine Impact of exercise on various diseases and the effect of various medical conditions on the *ability to participate in vigorous exercise and* competitive sports Principles of exercise testing and prescription for individuals with these conditions

417 Supervised Teaching in Physical Education in the Secondary School Cr var F S *Prereq 355 375* Supervised teaching in the secondary schools Advance registration required Offered on a satisfactory fail basis only

418 Supervised Teaching in Physical Education in the Elementary School Cr var F S *Prereq 280 384* Supervised teaching in the elementary schools Advance registration required Offered on a satisfactory fail basis only

435 Commercial Recreation (3-0) Cr 3 *Prereq 340* The purpose and function of the leisure *delivery system in the commercial setting* Development and operation of commercial goods and services offered in the leisure market Fee for field trips

***445 (545 DL) Legals Aspects of Sport** (3-0) Cr 3 *Prereq 402 or 475 or Acct 215* Analysis of the legal aspects of sport and athletics in contemporary society Includes use of the case study approach Designed for coaches athletic directors and others involved in sport management

455 Physiology of Exercise (3 3) Cr 4 F S *Prereq 258 Zool 156* Physiological basis of human performance effects of physical activity on body functions

†*458 (558 DL) Physical Fitness—Principles Programs and Evaluation (2 3) Cr 3 *Prereq 258 455 concurrent registration in 458L* Physiological principles of physical fitness design and administration of fitness programs testing evaluation and prescription cardiac rehabilitation programs

458L Laboratory in Fitness Programs and Evaluation (0 3) Cr 1 *Prereq Concurrent enrollment in 458 and CPR certification* Laboratory to accompany 458

465 Physical Activity and Aging (Geron 465) (2-0) Cr 2 Alt S offered 1993 *Prereq Psych 230 Zool 155* The effect upon movement of physical changes occurring in healthy aging as well as chronic conditions associated with aging Methods of assessing fitness and teaching movement activities in relation to gerontological factors

470 Evaluation in Physical Education (2 3) Cr 3 F *Prereq Senior classification* Principles underlying process of evaluation Selected test and measurement procedures and tools within the field of physical education

†475 Physical Education Curriculum Design and Program Organization (3 0) Cr 3 F *Prereq 375* Current practices and principles applied to curriculum development and to problems of *organization and administration of instructional and* extracurricular programs in physical education

485 Internship in Sport and Exercise Science Cr var maximum of 8 *Prereq Senior classification and advance registration* Observation and practice in selected sport and exercise science agencies Offered on a satisfactory fail basis only
A Exercise Science *Prereq Physical education majors only*
B Sport and Physical Activity *Prereq Physical education majors only*
C Sport Management *Prereq 340 physical education majors only*
D Coaching *Prereq 220 355 365 402 455 Psych 230 2 credits from PE courses numbered 301 311*

486 Supervised Coaching in Interscholastic Athletics Cr 1 to 3 *Prereq 220 2 credits from courses 301-311 355 365 402 455 Psych 230 senior classification admission to teacher education program and permission of instructor Advance registration required* Open only to students in the coaching endorsement program *Offered on a* satisfactory fail basis only

488 Practicum in Athletic Training Cr 1 to 2 maximum of 4 *Prereq Permission of instructor* Experience in application of athletic training techniques under supervision of certified athletic trainers Offered on a satisfactory fail basis only

490 Independent Study Cr var maximum of 6 *Prereq 6 credits in physical education and permission of coordinator* Independent study of problems of areas of interest in physical education and related areas
A Physical Education
B Coaching
H Honors

495 Seminar in Physical Education Cr 0 5 to 1 *Prereq Senior classification Offered on a* satisfactory fail basis only

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†Credit for only one in the following pairs of courses may be applied toward graduation 163 258 275 284 393 395 402 475

*See page 119 for information on dual listed courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Research Methods in Physical Education (2-0) Cr 2 *Prereq Graduate classification in physical education* Methods and techniques used in the *design and interpretation of research in physical* education Emphasis on styles of writing library use and computer applications

505 Research Laboratory Techniques in Exercise Physiology (0-4) Cr 2 *Prereq 455 or equivalent course with basic laboratory experience* Application and use of laboratory research equipment in exercise physiology including operation calibration and use in selected situations

***510 (410 DL) Medical Aspects of Exercise** (2-0) Cr 2 *Prereq 455* The role of exercise in preventive medicine Impact of exercise on various diseases and the effect of various medical conditions on the ability to participate in vigorous exercise and competitive sports Principles of exercise testing and prescription for individuals with these conditions

515 Qualitative Analysis of Human Movement (2 3) Cr 3 *Prereq 355* The kinematic analysis of developmental movement tasks and sport skills

520 The Social Analysis of Sport (3 0) Cr 3 *Prereq 360 Soc 134* Sociological analysis of sport with emphasis on sociological theory sports structure and function in modern industrialized society the systems of sport in regard to their role structure formal organization and professionaliza tion and its differentiation along social class age and sex

521 Sport Psychology (3-0) Cr 3 *Prereq 365 3 courses in psychology* Aspects of psychology which form a basis for understanding and explaining behavior in a sport context Variables underlying individual as well as group performance will be analyzed A critical analysis of current research literature

522 Social Psychological Perspectives of Sport and Motor Performance (2-0) Cr 2 *Prereq 360* Analysis of social-psychological dimensions that modify and facilitate motor behavior focuses on the individual and small group behavior in the sports context

523 Gender Roles and Sport (W S 523) (3 0) Cr 3 *Prereq 360 3 courses in sociology and/or psychology* Analysis of the influence of sport on male and female sex role development Survey of literature related to sport and sex role socialization stereotyping and conflict Discussion of future issues and alternative roles

530 Comparative Physical Education and Sport (3 0) Cr 3 *Prereq 260* A comparative analysis of dominant characteristics and developments in physical education and sport in selected countries

540 Administration of Physical Education and Sport (3-0) Cr 3 *Prereq 475 or 402* Theory and practice of administration in physical education and sport development of concepts related to the process of administration types of administrative behavior tasks and responsibilities of the administrator evaluation of effectiveness of administration

***545 (445 DL) Legal Aspects of Sport** (3-0) Cr 3 *Prereq 402 or 475 or Acct 215* Analysis of the legal aspects of sport and athletics in contemporary society Includes use of the case study approach Designed for coaches athletic directors and others involved in sport management

550 Advanced Physiology of Exercise I (2 3) Cr 3 *Prereq 505* Concepts and methods of assessing neurological muscular cardiovascular and respiratory adjustments to exercise

551 Advanced Physiology of Exercise II (2 3) Cr 3 *Prereq 505* Analysis of factors affecting work capacity and performance Human energy metabolism concepts and measurement

***558 (458 DL) Physical Fitness—Principles Programs and Evaluation** (2-3) Cr 3 *Prereq 163 455 concurrent registration in 591D* Physiological principles of physical fitness design and administration of fitness programs testing evaluation and prescription cardiac rehabilitation programs

560 Perceptual Motor Learning (2-3) Cr 3 *Prereq 372 Psych 333* Emphasis on theories of perceptual motor learning characteristics of the learner and the learning environment with implications for the design of learning settings and *further research*

561 Movement Motor Ability and Motor Performance of Children (2 0) Cr 2 to 3 *Prereq 284 Psych 230* The physical development and characteristic reactions of *children in relation to* motor performance Identification of special psychomotor needs of various age groups of children All literature and theories applied to the physical education environment

590 Special Topics Cr 1 to 3
A Physical Education
C Sport Management
D Exercise Physiology
E Sport Sociology
F Sport Psychology
G Motor Learning
H Kinesiology

591 Supervised Field Experience Cr 1 to 4 *Prereq 10 graduate credits in physical education and/or related areas* Supervised on the job field experience in special areas
A Physical Education
C Sport Management
D Exercise Physiology

593 Workshops Cr 1 to 3

***595 (395 DL) Adapted Physical Education** (2-3) Cr 3 F *Prereq 375* Specific disabling conditions in terms of etiology characteristics needs and potential for movement experiences Techniques of assessment prescription adaptation of activities methods and program planning Laboratory experience required May not be taken by students who have previously earned credit in 393

599 Creative Component Cr 1 to 3

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* See page 119 for information on dual listed courses

Courses for Graduate Students, major or minor

615 Seminar Cr 1 to 3

699 Research Cr arr *Prereq 10 credits in education*

History

George T McJimsey Chair of Department

Professors Apt, Bennett Cravens Dobson Hurt Keller Kottman, Marcus McJimsey Plakans Schwieder Wilson, Wilt

Emeritus Professors Geiger Lowitt Schofield

Associate Professors Avraamides McCarthy Pope Rawson, Ruebel Whitaker

Assistant Professors Evans, Madison Osborn Zaring

The department offers a variety of survey courses (200 series basically for first- and second-year students) designed to serve as either general education courses or as introductions to advanced courses in history or other subject areas The department also offers curricula leading to the B A and B S degrees in history the M A degree in history the M A and Ph D degrees in the history of technology and science and the Ph D degree in agricultural history and rural studies

In addition to the survey (200-level) courses advanced undergraduate courses are offered in the history of Europe Asia Latin America the United States technology and science, agriculture and of some selected topics

Undergraduate Study

The history major For a description of the undergraduate curriculum with a major in history see *Liberal Arts and Sciences Curriculum* The history major may earn either a bachelor of arts or bachelor of science degree Candidates for the B A must complete two years of university-level study in one foreign language or the equivalent The minimum required for a major in history is 30 credits of which at least 24 must be in courses above the 200 level A minimum of 12 credits above the 200 level must be taken in residence at Iowa State All history majors must complete two enrollments in Hist 495 (for R credit) or if qualified and willing one graduate-level seminar The department requires that majors demonstrate their proficiency in the English language with a grade of C or better in Engl 104 and 105 (or 105H), and in Hist 495 or any graduate-level seminar History majors who choose minors in other departments usually select from such complementary disciplines as political science English sociology psychology economics philosophy or foreign languages and literatures

For a description of the major in history as preparation for professional programs see *Teacher Education* and *Preprofessional Study* Students majoring in history may also earn a second major in international studies see *International Studies*

Although the department does not require specialization, majors and nonmajors may elect to group their courses in one of several areas of emphasis The following short list shows the department s undergraduate courses by such areas of emphasis Qualified undergraduates may also take some 500-level graduate courses with permission of the instructor (see listing of graduate courses below) Consult the main listing of courses for full description

Europe 201 202 304 305 325 326 401 402 403 405 406 408 410 411 412 414 417 419 420 421 422 424 426 427 428 430 431
Asia, Africa, Latin America 207 208 311 336 337 338 340 341 441
United States 221 222 351 352 370 386, 450 451 454 455 457 458 459 462 463 464 465 467 470 471 472
Technology and Science 271 272 280 281 284 285 323 362 387 388 481 482 485 488 489
Agriculture 365 366 460 461 476
Topical Courses 301 375 376 381 382 384 389 390 435 436, 490 495

Courses dealing with the history of technology and science have been structured to offer a sequence leading from basic surveys through courses in the history of particular technologies and sciences In this area of emphasis it is recommended that students electing Hist 481 482 or 485 have taken a basic survey in the history of technology and science (either Hist 280-281 or 284-285) or have taken a college-level course in an appropriate technology or science or seek the permission of the instructor An undergraduate emphasis in the history of technology and science could include either Hist 281-282 or 284-285 and some combination from Hist 323 362 387 388 480 481 482 485 488 and 489

The history minor The department offers a minor in history which may be earned with 15 credits in history courses of which at least 9 must be in courses above the 200 level The history minor is most frequently chosen by students majoring in political science English journalism computer science and business

Graduate Study

Normally graduate students in history take courses at the 500 and 600 level but they may also take any 400-level course except 490 and 495 for major graduate credit No more than 12 credits of 400-level courses however may be used toward the minimum credits required for a graduate degree Additional work is required for graduate credit in 400 level courses Courses in the M A and Ph D degree programs may also be taken for minor credit by students majoring in other departments

The department participates in the interdepartmental minor in technology and social change (see *Index*)

Most history graduate courses are either proseminars or seminars Proseminars acquaint students with the historical literature of a field and prepare them for careers in teaching and research Seminars require students to conduct original historical research and to write extensive research papers reporting the results

The M A in history For the M A in history, students may elect a thesis or a nonthesis program A minimum of 30 credits of acceptable work is required at least 21 of which must be taken in the Department of History A student shall demonstrate proficiency in the use of a research tool such as a foreign language statistics computer programming or the like as prescribed by his or her advisory committee The M A in history program serves as the basis for continued study in history law or business preparation for teaching in high school or junior college preparation for government service, or as part of a general education For international students a TOEFL score of 600 is required at the time of admission See the departmental brochure on the M A in history for a full discussion of the requirements

The M A and Ph D in history of technology and science The graduate program in the history of technology and science examines the role of technology and science in the formation of modern societies and their attitudes toward people and the world The program is structured in a sequence of courses leading to the M A and Ph D degrees Since these courses approach their subject in the context of social and cultural change they are also open to and appropriate for students in engineering the sciences, science education, and science journalism For a thorough description of the program requirements see the department s brochure on the history of technology and science program

The Ph D in agricultural history and rural studies The program is designed as a Ph D program but students without an M A in history will be expected to qualify for the departmental M A in history while progressing toward the doctorate In some cases the M A may be recommended as the terminal degree Thirty semester hours of graduate credit are required for the M A and 72 for the Ph D Students who continue beyond the M A are expected to pass an admittance-to-doctoral-candidacy examination complete a dissertation and defend it orally in the Ph D final examination See the departmental brochure on the program for a full description of requirements

The following short list of the department s graduate courses is organized by areas of emphasis see the main listing for complete descriptions Courses at the 500 level are taken by graduate students (major or minor) and occasionally by qualified under-

graduates those at the 600 level are taken by graduate students (major or minor) only
Europe 512 series 594 series
Asia, Latin America 510 513 592 595
United States 511 series 593 series
Technology and Science 570 572 574 575 576 577 600 601 602 603 604 605 606 607
Agriculture and Rural Studies 550 552 series 554 series 556 608 609 610
Topical 514 580 583 series 590 597, 598

Courses Primarily for Undergraduate Students

***201, 202 Introduction to Western Civilization** (3-0) Cr 3 each 201 F 202 S Western civilization from ancient Mediterranean world to the present Social and cultural developments economic and political ideas and institutions problems of historical change and continuity 201 to 1650 202 since 1650

207 Chinese Civilization (3 0) Cr 3 F Bennett Origins development decline and transformation of China from earliest times to the present

208 Japanese Civilization (3-0) Cr 3 S Bennett Origins development and transformation of Japan from earliest times to the present

221 222 Survey of United States History (3-0) Cr 3 each 221 F 222 S 221 Colonial foundations revolution confederation and constitution nationalism and democracy sectional disunity Civil War and reunion 222 Industrial ization emergence as a great power boom and depression war internationalism and the Cold War the modern industrial society

271 272 Physics History and Society (Phys 271 272) See *Physics*

280 281 Introduction to the History of Science (M E 280 281 Cl St 280) (3-0) Cr 3 each 280 F 281 S Wilson 280 Ideas of nature from Babylonia to the Renaissance 281 Science from the seventeenth century scientific revolution to Darwin and Einstein

284, 285 Introduction to the History of Technology and Engineering (M E 284 285) (3-0) Cr 3 each 284 F 285 S Marcus 284 Technology in various civilizations including Greece Rome and Medieval Renaissance and early modern Europe 285 Technology in the Western world in the nineteenth and twentieth centuries

301 Historical Perspectives on Peace and War (3-0) Cr 3 F Osborn The social economic political and ideological dynamics of human conflict that have contributed to the dialectic of peace and war over the past five hundred years

304 Cultural Heritage of the Ancient World (Cl St 304) (3-0) Cr 3 F Avraamides Historical examination of the art literature thought and religious beliefs of the major civilizations of the ancient Mediterranean countries until the end of the *8th century*

305 Cultural Heritage of the Modern World (3-0) Cr 3 S Examination of parallel formal and structural elements in scientific thinking technological design and composition in *literature painting architecture* and music from the late medieval period to the 20th century

311 Introduction to African History (Af Am 311) (3-0) Cr 3 F McCarthy The diversities that characterize not only African societies and individuals but also the geographical and ecological regions of Africa Major emphasis on the period *from 1700 to the present accelerating* European over rule African reactions and initiatives subsequent decolonization and the still incomplete re-establishment of independence

323 Science and Religion *(Relig 323)* (3-0) Cr 3 F Wilson History of the changing interplay of science and religion in man s understanding of nature from Platonism to Darwinism

325 326 History of England *(3 0) Cr 3 each* 325 F 326 S Zaring 325 England from pre-history to 1688 Growth of political and religious institutions medieval social economic and constitutional development Tudor and Stuart monarchies Reformation and civil war 326 England since 1688 Political and social change constitutional and *economic development Britain as a world power* modern British society

***336, 337 History of Modern China** (3-0) Cr 3 each 336 F 337 S Bennett 336 China from 1644 to 1912 *internal and external stimuli on the* traditional structure leading to reform and revolution 337 China from 1912 to the present the search for a new order and the continuing Chinese revolution

338 Modern Japanese History (3-0) Cr 3 Alt yr ** Bennett Japan 1600 to the present emphasis on the transformation of feudal Japan into a post industrial society

340, 341 History of Latin America (3-0) Cr 3 each 340 F 341 S Osborn 340 History of colonial Latin America from European discovery and colonization to the wars for independence **341** *Modern Latin America from national origins at the* beginning of the nineteenth century to the present

351 352 The Social and Cultural History of the American People (3 0) Cr 3 each 351 F 352 S Cravens History of *the ordinary peoples of the* United States since 1800 how they lived worked and played The development of society popular ideas and their dissemination conditions of life work and entertainment the arts music architectural styles material culture rural and urban lifestyles sex roles majority-minority relations religion mass culture corporations and technology in modern times 351 from 1800 to 1900 352 since 1900

353 354 History of African Americans (Af Am 353 354) (3 0) Cr 3 each 353 F 354 S Pope 353 The African roots of Black culture slavery abolition Civil War Reconstruction 354 Institutionalization of segregation urban migration Harlem Renaissance Garvey movement the Depression and the world wars civil rights movement and Black Power

362 Engineering in History (M E 362) (3 0) Cr 3 Alt Yr ** Development of the engineering profession and its place in society with emphases on the modern period technocracy and technology assessment

365 366 History of American Agriculture (3-0) Cr 3 each 365 F 366 S Whitaker American agricultural development from colonial times to the present 365 European background colonial period to 1865 366 1865 to the present

370 History of Iowa (3-0) Cr 3 F S Schwieder Survey of major social cultural and economic developments in Iowa from the late 1700s Emphasis on minority groups pioneer life early economic development industrial development educational and religious development and *outstanding personalities*

375 United States Business History (3-0) Cr 3 F Dobson The development of business structures institutions and practices from the colonial joint stock companies to *the modern conglomerate* including economic legal regulatory and international aspects

376 International Business History (3-0) Cr 3 S McCarthy Comparative approach based on selected examples from Europe Africa Asia and Latin America to such topics as entrepreneurship organization and the controversial roles of business *people and groups in creating* both development and underdevelopment

381 International Economic History (Econ 381) (3-0) Cr 3 F McCarthy Origins and evolution of *European capitalism varieties of agricultural and* industrial transformation in Europe expansion of Europe and impact on Africa Caribbean Latin America and Asia

382 United States Economic History *(Econ 382)* (3-0) Cr 3 S McCarthy Origins and evolution of United States capitalism importance of varieties of economics importance of legal structures growing interdependence of power sectors

384 History of the Family in the Western World (3-0) Cr 3 S Plakans An exploration of changes in family forms and *family life from the medieval* centuries to the present with the American familial experience considered as one example of such change

386 History of Women in America *(W S 386)* (3 0) Cr 3 F S A survey of social economic and political aspects of women s role from the colonial era to the present with emphasis on employment *education concepts of sexuality* and the changing nature of the home

387 Technology, Science, and Society in Modern Europe (M E 387) (3 0) Cr 3 Alt yr ** Wilson *From the late eighteenth-century beginnings of the* industrial revolution in Britain to World War I Examination of scientists and engineers influence on society and of society on them

388 History of Physics and Astronomy *(3 0)* Cr 3 Alt yr ** Wilson From the eighteenth-century triumph of Newton s gravitational theory to twentieth-century ideas of an evolving universe The development of physical ideas and their increasing application to astronomy

***389 390 Modern Military History** (3-0) Cr 3 each 389 F 390 S Wilt 389 Relationships *between war and society in America* and Europe from 1750 to 1918 390 Warfare during the twentieth century emphasis on the World War II experience

401 Ancient Near East *(3-0) Cr 3 S Avraamides* Political socio economic artistic and religious history of ancient Mesopotamia and Egypt

402 Ancient Greece (Cl St 402) (3-0) Cr 3 F Avraamides Ancient Greece from the Bronze Age to the Hellenistic Kingdoms the evolution of the Greek polis and its cultural contributions

403 Ancient Rome (Cl St 403) (3-0) Cr 3 S Ruebel Political cultural and institutional history of Ancient Rome with emphasis on the period from the Hannibalistic War to the fall of the Flavian dynasty A D 96

***405 406 History of Medieval Western Europe** (3-0) Cr 3 each 405 F 406 S Madison Development of political economic and social institutions 405 Early and Central Middle Ages *284 1050 406 High and Late Middle Ages* 1050 1500

408 Europe 1500-1648 (3-0) Cr 3 Alt yr ** Zaring The Northern Renaissance the Church and Luther Protestant reform and *Roman Catholic* counter reform social cultural and economic changes Spain in triumph and decline religious wars and the emergence of France

410 19th Century Europe (3 0) Cr 3 S Apt Nationalism revolution and war

***411 412 Contemporary Europe** (3-0) Cr 3 each F S Wilt 411 Europe from 1914 to the end of World War II 412 Europe since 1945 with emphasis on political economic and social developments

414 European Cultural and Intellectual History (3-0) Cr 3 Alt yr ** Apt A study of the perennial ideas nature man God society history and creativity from Dante to Sartre

417 European Society and the Industrial Revolution (3-0) Cr 3 Alt yr ** Plakans England and the continent during the period of European industrialization (1750-1900) with emphasis on the relationship between industrial and social change

419 History of Modern France (3-0) Cr 3 Alt yr ** Apt From absolutism to revolution and the rise of modern democracy

420 History of the Mediterranean (3 0) Cr 3 Apt Spain Italy and Portugal from the Renaissance to the present

***421 422 History of Russia** (3-0) Cr 3 each 421 F 422 S *Rawson 421 Russia to 1850 Origins* of the Russian people Byzantine influences Mongol invasion rise of Moscow Westernization 422 Russia since 1850 Reform and revolution transformation of society the USSR as a world power recent changes

424 History of Modern Germany (3-0) Cr 3 Alt yr ** Wilt Cultural economic and political developments in nineteenth and twentieth century Germany

426 Nationalism and Communism in Eastern Europe (3-0) Cr 3 F Plakans A survey of nationalist movements nation-building and the communist revolutions in Eastern Europe in the nineteenth and twentieth centuries

427 428 Medieval England (3 0) Cr 3 each 427 F 428 S Madison Medieval English society and government examined through contemporary sources in translation Legal and constitutional developments emphasized 427 Anglo Saxon Norman and Angevin England c 342 1189 428 Plantagenet Lancastrian and Yorkist England 1189-c 1509

430, 431 Modern England (3-0) Cr 3 each Alt yr ** Zaring 430 England from 1688 to 1830 Political social cultural economic development England as a great power 431 England since 1830 Parliamentary and constitutional development social reform and economic change Imperial Britain the welfare state

435 436 History of Ancient and Medieval Warfare (3-0) Cr 3 each 435 F 436 S Madison Warfare in its military cultural and political contexts 435 Paleolithic to about 423 A D 436 From about 284 A D to about 1527 A D

441 History of Modern Mexico and Central America (3 0) Cr 3 S Osborn Political economic and social development of Mexico and Central America in the nineteenth and twentieth centuries

450 Colonial America (3 0) Cr 3 F Keller Exploration colonization and development of political economic social and cultural institutions of the North American colonies before 1754

451 American Revolution (3-0) Cr 3 S Keller Participants ideas and events leading to independence and the foundation of the American Republic 1754 to 1787

454 Prologue to the U S Civil War (3 0) Cr 3 F McJimsey Origins of second party system Social and economic forces that sustained the system and ultimately caused its collapse and sectional division 1815-1861

455 The U S Civil War and Reconstruction (3 0) Cr 3 S McJimsey Emphasis on military and political events of the Civil War and their influence on postwar America 1861-1877

457 The Populist Progressive Years (3-0) Cr 3 S Dobson The United States transition from an agrarian society to a mature industrial giant emphasizing political economic and social developments of the late 19th and early 20th centuries

***458 459 U S Since World War I** (3 0) Cr 3 each 458 Alt yr ** 459 S Kottman or Evans 458 America in depression and war Major developments of the nation 1919 1950 new economic era Hoover and depression New Deal World War II and Cold War 459 Contemporary America Major developments of the nation since 1950 Korean War modern Republicanism New Frontier and the Great Society Vietnam social disturbances and conservative resurgence

460 The Great Plains (3 0) Cr 3 F Hurt History of the Great Plains from prehistoric period to the present Emphasis on agricultural and rural development Native Americans cattle ranging land policy agrarian reform movements and federal policy

461 The Rural South (3-0) Cr 3 S Hurt Agricultural and rural history of the South from colonial period to the present Emphasis on economic social and political change Slavery Populism the New Deal and the civil rights movement

***462 463 History of American Thought** (3-0) Cr 3 each Alt yr ** Cravens 462 Rise of American religious social and political thought and the arts and sciences from colonial times to the late nineteenth century development of a national civilization 463 American religious social and political thought and the arts and sciences since the late nineteenth century the meaning of democracy in the urban industrial machine age

464 Nineteenth Century American Social History (3-0) Cr 3 Alt yr ** Schwieder Rise of modern industrial society in nineteenth century America the family churches and other social institutions reform immigration social and geographical mobility impact of urbanization

465 The U S Westward Movement and Frontier Development (3 0) Cr 3 Alt yr **Evans Occupation distribution and political organization of the public domain Indian white relations economic exploitation of the public domain (trapping mining lumbering ranching farming) and social adjustments (law and order religion education and culture)

467 History of United States Foreign Policy Through World War I (3-0) Cr 3 F Dobson Diplomacy from the American Revolution America s rise as a world power the First World War and post-war entanglements

***470 471 The United States and the Cold War** (3-0) Cr 3 each 470 F 471 S Kottman The relationship between the U S and the Communist world from the Bolshevik revolution in 1917 until the collapse of the Soviet system in 1991 470 From 1917 to 1950 American nonrecognition of the Communist regime in Russia military intervention in the Russian Civil War recognition of the USSR and the subsequent disillusionment the Grand Alliance during the Second World War the strained postwar U S -Soviet relationship and the initial American responses to Chinese Communism 471 1950 to 1991 The Korean War and the global ramifications heightened tensions during the 1950s and 1060s rise and fall of detente in the 1970s confrontations of the early 1980s and the advent of the New World

472 American Environmental History (Env S 472) (3 0) Cr 3 F Evans Evolving history of the North American environment and humans interaction with it from pre European/African settlement through the 20th century Exploration of comparative cultural attitudes toward nature relationship among science technology and the environment modern conservation and environmental movements environmental planning and policymaking

476 History of European Agriculture (3 0) Cr 3 Alt yr ** Avraamides Plakans A survey of the history of agricultural techniques land use patterns and rural social forms in Europe from the Neolithic revolution to the present

481 History of Chemical Sciences and Their Technologies (3-0) Cr 3 Alt yr ** Development of theories and processes relating to the nature and transformation of matter in chemistry and associated engineering fields Emphasis on chemistry and chemical theory since the seventeenth century and on the creation of concepts and processes for the controlled production of substances on an industrial scale since the eighteenth century

482 History of the Life Sciences and Medicine (3-0) Cr 3 Alt yr ** Marcus Emergence of the human sciences and technologies—medicine physiology cytology public health and social sciences—in the social and cultural context of the Western world Emphasis on developments from Darwin and Pasteur to the present

485 History of Physics and Physical Engineering (M E 485) (3-0) Cr 3 Alt yr ** Wilson Interactions between the science of physics and the branches of engineering associated with it from the post-Newtonian era to the age of Einstein

488 History of American Technology (M E 488) (3-0) Cr 3 Alt yr **Cravens Technology in America with emphasis on the industrial revolution and its consequences American invention and its relation to science technology as social response and perception of it as social problem locus of support for process of technological innovation

489 History of American Science (M E 489) (3 0) Cr 3 Alt yr **Cravens Science and its social relationships since the mid nineteenth century interaction of scientific discoveries and the development of society Continuing impact of Darwinism and other scientific theories science and social thought modern medicine and public health science and industry science and agriculture the social sciences government and science science and the consumer the atomic age big science and the environmental dilemma the energy crisis the role of science in a democracy

490 Independent Study Cr 1 to 3 each time taken *Prereq 9 credits in history permission of department chair No more than 9 credits of Hist 490 may be counted toward graduation* Reading and reports on problems selected in conference with each student

495 Historiography and Research Writing (1 0) Cr R F S Taken in conjunction with 400-level course *Prereq Major in history Required of majors*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

510 Proseminar in East Asian History (3 0) Cr 3 each time taken *Prereq Permission of instructor* Readings in East Asian history Topics vary each time offered

511 Proseminar in American History (3-0) Cr 3 each time taken *Prereq Permission of instructor* Readings in American history Topics vary each time offered
- A Colonial Period
- B Nineteenth Century
- C Twentieth Century
- D Environment

512 Proseminar in European History (3-0) Cr 3 each time taken *Prereq Permission of instructor* Readings in European history
- A Ancient (Cl St 512A)
- B Medieval
- C Modern

513 Proseminar in Latin American History (3-0) Cr 3 each time taken *Prereq Permission of instructor* Readings in Latin American history Topics vary each time offered

514 Proseminar in Comparative Economic History (3 0) Cr 3 each time taken *Prereq Permission of instructor* Readings in comparative economic history Topics vary each time offered

550 Proseminar in European Agricultural History and Rural Studies (3-0) Cr 3 each time taken
- A Modern European Rural Life
- B Twentieth Century Europe

552 Proseminar in American Agricultural History and Rural Studies (3 0) Cr 3 each time taken
- A American Agriculture
- B The Southern Plantation
- C Midwestern Rural Society
- D Twentieth Century Farm Policy
- E Agricultural Development in the Twentieth Century American West
- F Agrarian Reform Movements
- G Agricultural Sciences and Technology
- H Women in Rural Life

554 Proseminar in Latin American Agricultural History and Rural Studies (3-0) Cr 3 each time taken
- A Caribbean Rural Life
- B Comparative Slavery

556 Proseminar in Asian Agricultural History and Rural Studies (3-0) Cr 3 each time taken
- A East Asian Agricultural Rural Patterns

570, 571 Seminar in General History of Science I II (3-0) Cr 3 each Yr The history of science from pre-classical civilizations to the Age of Galileo and from Galileo to modern times with emphasis on the historical literature varying interpretations of the period and problems for continuing research

572 Seminar in American Environmental History (3 0) Cr 3 S Evans History of human interaction with the North American environment from pre European settlement through the 20th century Emphasis on historical literature and topics for individual research

74 575 Seminar in General History of Technology I II (3-0) Cr 3 each Yr Marcus The history of technology from pre-classical civilizations to the eve of the Industrial Revolution and from the Industrial Revolution to modern times with emphasis on the historical literature varying interpretations of the period and problems for continuing research

76 577 Proseminar in Historiography of Technology and Science I II (3 0) Cr 3 each Yr Investigation in the bibliography philosophy and professional problems of the history of technology and science Required of all graduate students in the history of technology and science program

80 Museum Internship Cr varies each time taken *Prereq 15 graduate credits in history and permission of instructor*

83 Historical Methods (3-0) Cr 3 *Prereq Permission of instructor* Original sources bibliography criticism of evidence form statistical analysis
A Written Evidence and Analysis
B Statistical Evidence and Analysis

85 Teaching Methods Cr 1 to 2 each time taken *Prereq Permission of instructor* Topics vary each time offered
A Teaching Methods
B Curriculum Development in History
C Implementing Teaching Techniques

90 Special Topics Cr 1 to 3 each time taken *Prereq Permission of instructor*

92 Seminar in East Asian History (3-0) Cr 3 S *Prereq Permission of instructor* Topics vary each time offered

93 Seminar in American History (3 0) Cr 3 each time taken *Prereq Permission of instructor* Topics vary each time offered
A Colonial Period
B Nineteenth Century
C Twentieth Century

94 Seminar in European History (3 0) Cr 3 each time taken *Prereq Permission of instructor* Topics vary each time offered
A Ancient (Cl St 594A)
B Medieval
C Modern

95 Seminar in Latin American History (3 0) Cr 3 each time taken *Prereq Permission of instructor* Topics vary each time offered

97 Seminar in Comparative Business and Economic History (3-0) Cr 3 each time taken *Prereq Permission of instructor* Topics vary each time offered

98 Introduction to Archives and Special Collections (3 0) Cr 2 each time taken *Prereq Graduate classification*

Courses for Graduate Students, major or minor

600 Seminar in Seventeenth and Eighteenth Century Science (3-0) Cr 3 Alt yr ** *Prereq Permission of instructor* Emphasis varies each time offered

601 Seminar in Seventeenth and Eighteenth Century Technology (3 0) Cr 3 *Prereq Permission of instructor* Emphasis varies each time offered

602 Seminar in Nineteenth Century Science (3 0) Cr 3 Alt yr **Prereq *Permission of instructor* Emphasis varies each time offered

603 Seminar in Nineteenth Century Technology (3-0) Cr 3 Alt yr **Marcus *Prereq Permission of instructor* Emphasis varies each time offered

604 Seminar in American Science (3 0) Cr 3 Alt yr ** *Prereq Permission of instructor* Emphasis varies each time offered

605 Seminar in American Technology (3 0) Cr 3 Alt yr **Cravens *Prereq Permission of instructor* Emphasis varies each time offered

606 Seminar in Early Twentieth Century Science (3-0) Cr 3 Alt yr ** *Prereq Permission of instructor* Emphasis varies each time offered

607 Seminar in Early Twentieth Century Technology (3 0) Cr 3 Alt yr ** Marcus *Prereq Permission of instructor* Emphasis varies each time offered

608 Seminar on European Rural Life (3 0) Cr 3 Plakans *Prereq Permission of Instructor*

609 Seminar on Twentieth Century American Farm Policies (3-0) Cr 3 S *Prereq Permission of instructor*

610 Seminar on American Rural Life (3 0) Cr 3 Alt yr ** *Prereq Permission of instructor*

699 Research

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*Each course may be taken independently of the other

**Refer to the *Schedule of Classes* or consult the department for year and/or semester of offering

Horticulture

Michael H Chaplin Head of Department

Professors Chaplin Christians Domoto Fretz Hodges Taber

Emeritus Professors Bauske Denisen Hall Mahlstede Schilletter Weigle

Associate Professors M Agnew N Agnew Gladon Koranski Stephens Summers

Assistant Professors Graves Hannapel Hefley Nonnecke Prince Widrlechner

Instructor Gaul

Undergraduate Study

For undergraduate curriculum in horticulture leading to the bachelor of science degree see *Horticulture Curriculum*

The horticulture curriculum is designed to permit commodity emphasis in general horticulture landscape horticulture floriculture fruit production vegetable production nursery management or turfgrass science and management Specialization options complete the educational goal by combining one of the above interest areas with those skills required in production and business management science or turfgrass management

The rapidly expanding field of horticulture provides employment opportunities in nurseries seed companies interior landscaping firms greenhouses garden centers orchards food processing companies or vegetable farms The allied industries associated with horticulture provide employment in the areas of sales and management Turf managers are needed for golf courses athletic fields parks and the lawn care industry Further opportunities exist in sod production, landscape development and maintenance as well as botanical gardens conservatories and arboreta

Opportunities also exist for further education in graduate school to prepare for a career in research teaching and extension

Students have the option of selecting a secondary major in interdepartmental programs pest management seed science agricultural extension education environmental studies or international agriculture (See *Index*)

The department offers a minor in horticulture that may be earned by taking Hort 221 plus at least 12 credits in horticulture at the 200 level or above

Graduate Study

The department offers master of science and doctor of philosophy degrees with a major in horticulture and minor work for students in other departments Under special circumstances a nonthesis master s degree is available through the master of agriculture program

Prerequisite to major graduate study is the completion of courses covering horticulture botany and the underlying sciences

Students majoring in horticulture usually will take minor work in agronomy botany (cytology morphology or physiology) chemistry entomology genetics pathology or statistics

There is no uniform foreign language requirement for either the master of science or the doctor of philosophy degree

The department also cooperates in the interdepartmental majors genetics water resources and plant physiology (See *Index*)

Open to graduate students for minor credit only 351 351L 420 422 424 433 434 442 451 461 471 493

Courses Primarily for Undergraduate Students

110 Orientation in Horticulture (1 0) Cr R F Introduction to the field of horticulture

121 Home Horticulture (2 0) Cr 2 F S SS Growing plants in and around the home including requirements for growing house plants container gardening designing and maintaining flower fruit and vegetable gardens lawn tree and shrub maintenance

123 Home Horticulture Indoor Plant Recitation (1 0) Cr 1 F S SS *Prereq Credit or enrollment in 121* Demonstrations and activities plant identification plant propagation terrarium and dish garden construction and floral design Plant materials fee

124 Home Horticulture Garden Plant Recitation (1-0) Cr 1 F S SS *Prereq Credit or enrollment in 121* Demonstrations and activities that illustrate the principles of growing garden plants Plant selection and garden design for landscape fruit and vegetable gardens plant propagation and plant identification Plant materials fee

151 Turfgrass Maintenance (2 0) Cr 2 SS Fundamentals of lawn care and golf course mangement including species identification and use establishment renovation fertilization mowing pest control and other cultural practices

221 Principles of Horticulture (2 2) Cr 3 F S *Prereq Biol 201* Biological principles of growing horticultural crops including anatomy reproduction light temperature water nutrition and growth and development Laboratory exercises emphasize environmental factors and permit detailed observation of plant growth

233 Herbaceous Ornamental Plants (2 2) Cr 3 F *Prereq* 221 *Bot 306 recommended* Culture and landscape use of annual and perennial garden flowers Annual and perennial garden design garden fertilization maintenance and pest control rose culture spring and summer flowering bulbs rock gardens and other specialty gardens Emphasis on plant selection culture and production systems

241 Woody Ornamental Plants (2-3) Cr 3 F *Prereq 221 Bot 306* The identification botanical characteristics growth habit origin ornamental value culture and landscape uses of native and introduced woody plants used as ornamentals in Iowa

322 Plant Propagation (2 2) Cr 3 Alt S offered 1993 *Prereq 221 or Biol 202* Fundamental principles underlying sexual and asexual propagation of plants practice in reproducing plants by use of seeds leaves stems and roots

332 Greenhouse and Controlled Environments (2-0) Cr 2 F *Prereq 221 and enrollment in 332L for horticulture majors* Principles of greenhouse operation and management Production of commercial florists potted plants and bench crops

332L Greenhouse and Controlled Environments Laboratory (0-3) Cr 1 F *Prereq 221 and credit or enrollment in 332* Demonstrations and activities in crop production and greenhouse environmental control Field trips Those enrolled in the horticulture curriculum are required to take 332L in conjunction with 332 except by permission of the instructor

338 Seed Science and Technology (Agron 338) See *Agronomy*

342 Landscape Establishment and Maintenance (2-3) Cr 3 F *Prereq 341 or L A 321* Principles and practices involved with establishment and maintenance of woody ornamental plants and turfgrasses in the landscape Laboratory work involves reading blueprints staking sites for location and grade planting and maintaining plant materials

344 Landscape Horticulture (L A 344) (2-6) Cr 4 S *Prereq 241 or L A 321 recommended* Principles and practices of designing residential and small business landscapes Site analysis terrain alteration for drainage and aesthetics functional areas and circulation use of construction and plant materials for site development Basic drafting perspective drawing and plan refinement techniques Materials fee field trip fee

351 Turfgrass Establishment and Management (Agron 351) (3-0) Cr 3 F *Prereq 221 or Agron 114 or Biol 201* Principles and practices of turfgrass propagation and management Specialized practices relative to home lawns golf courses athletic fields highway roadsides and seed and sod production The biology and control of turfgrass pests

351L Turfgrass Establishment and Management Laboratory (Agron 351L) (0-3) Cr 1 F *Prereq Credit or enrollment in 351 Those enrolled in the horticulture curriculum are required to take 351L in conjunction with 351 except by permission of the instructor*

391 Horticultural Management Experience Cr arr maximum of 3 F S SS *Prereq 221 permission of instructor* A structured work experience for the student to gain insight into management operations associated with production of horticultural crops Offered on a satisfactory-fail basis or on a graded basis in those cases where a special creative component to be decided upon by the faculty supervisor and student is completed

420 Plant Nutrition (Pl HP 420) (2-2) Cr 3 S *Prereq Agron 154* Factors influencing nutrient absorption and composition criteria of essentiality and roles of the elements nutrient status and nutrient balance techniques for determining nutritional status and effects of fertility programs

422 Postharvest Technology (2-3) Cr 3 Alt F offered 1993 *Prereq 221 junior or senior classification* Principles methods and techniques related to postharvest maintenance of quality of horticultural commodities Emphasis on the effects of handling storage facilities and techniques and quality evaluation Field trips

***423 (523 DL) Plant Tissue Cell and Protoplast Culture** (2-3) Cr 3 Alt S offered 1994 *Prereq Bot 310 or 320 and permission of instructor* Theory and techniques of plant tissue culture including organogenesis somatic embryogenesis micropropagation anther and embryo culture protoplast isolation and culture and transformation Applications to agriculture

424 Sustainable Horticulture Systems (2-0) Cr 2 S Inquiry into ethical issues and environmental consequences of horticultural cropping systems and production practices Emphasis on production systems that are resource efficient environmentally sound socially acceptable and profitable

***425 (525 DL) Horticultural Plant Breeding** (2-0) Cr 2 Alt F offered 1994 *Prereq Biol 301 or Gen 330* Breeding techniques and methods required for the improvement of horticultural plants

433 Tropical Plants and Interior Landscaping (2 2) Cr 3 Alt S offered 1994 *Prereq 221 Bot 306 recommended* Identification culture and interior landscape use of tropical ornamental plants Emphasis on understanding the interior environment planning design installation and maintenance schemes and plant selection for interior landscapes (malls lobbies offices etc)

434 Floriculture Crop Production (2 3) Cr 3 Alt S offered 1995 *Prereq 332 and 332L* Principles and practices of the production and marketing of floriculture bench and potted crops Emphasis on the physiology of growth and development and environmentally sound methods of maintaining fertility growth control and pest control

437 Seeds Problems and Issues (Agron437) See *Agronomy*

442 Nursery Crop Production (2 2) Cr 3 Alt F offered 1994 *Prereq 241 or L A 321 Agron 154* Management selections of a nursery site and soil and nutrition management for field and container grown nursery plants plant growth irrigation storage facilities

451 Professional Turfgrass Management (2-0) Cr 2 Alt S offered 1995 *Prereq 351* Turfgrass science including the study of (1) specific information on soil chemistry and soil modification as they relate to the development and maintenance of turfgrass areas and (2) specialized management practices used in the professional lawn care and golf course industries

461 Fruit and Nut Crop Production (2 2) Cr 3 Alt S offered 1995 *Prereq 221* Principles and practices of small fruit tree fruit and nut culture and production Morphology physiology of growth and development plant establishment pest management pruning training harvesting storage and marketing

471 Vegetable Crop Production (3-0) Cr 3 Alt S offered 1994 Principles and practices of vegetable production Methods of maximizing yield and quality of vegetables Harvesting storage and marketing

490 Independent Study Cr arr *Prereq Senior classification in horticulture permission of instructor A maximum of 4 credits of 490 may be used toward the total of 128 credits required for graduation* Investigation of topic holding special interest to student Comprehensive report required Election of course and topic must be approved by department head
A Floriculture
B Nursery Crops
C Turfgrass
D Fruit Crops
E Vegetable Crops
F Cross-Commodity
H Honors

493 Workshop in Horticulture Cr arr Off campus Offered as demand warrants Workshops in horticulture

498 Problem Analysis of Horticultural Systems (3-0) Cr 3 F *Prereq Senior classification* Investigation of the multidisciplinary system approach to problem solving in horticultural cropping systems Emphasis on holistic approaches to decision making and development of plans for implementation Includes intensive written oral and interpersonal communication

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

521 Controlled Plant Environments (2-0) Cr 2 Alt S offered 1994 *Prereq Bot 310 or 320* Principles methods and techniques related to the measurement and control of environmental factors affecting plant growth under controlled conditions Light (irradiance) nutrition temperature humidity carbon dioxide water air movement and related factors and how they affect plant growth and development

522 Postharvest Physiology (4-0 first 8 weeks) Cr 2 Alt S offered 1994 *Prereq 422 Bot 310 or 320 B B 301* Emphasis on the physiological mechanisms and underlying molecular biology that controls the maturation ripening and senescence of horticultural commodities Respiration ethylene metabolism pigment changes carbohydrate metabolism and gene expression during the postharvest period

***523 (423 DL) Plant Tissue Cell and Protoplast Culture** (1 3) Cr 3 Alt S offered 1994 *Prereq Bot 310 or 320 and permission of instructor* Theory and techniques of plant tissue culture including organogenesis somatic embryogenesis micropropagation anther and embryo culture protoplast isolation and culture and transformation Applications to agriculture

***525 (425 DL) Horticultural Plant Breeding** (2-0) Cr 2 Alt F offered 1994 *Prereq Biol 301 or Gen 330* Breeding techniques and methods required for the improvement of horticultural plants

551 Growth and Development of Perennial Grasses (Agron 551) (2-0) Cr 2 Alt S offered 1995 *Prereq Bot 310 or 320* The grass plant Selected topics on anatomy morphology and physiology relative to growth and development of perennial grasses Emphasis on growth and development characteristics peculiar to grasses and variations of such characteristics under natural and managed conditions

552 Diseases of Turfgrasses (Pl HP 552) (2-0) Cr 2 Alt S offered 1994 *Prereq 351 Pl HP 407* Principles of disease development in grasses adapted to turf Emphasis on disease cycles epiphytology pathogenesis and control

590 Special Topics Cr arr *Prereq A major or minor in horticulture*

593 Workshop in Horticulture Cr arr Workshops in horticulture with emphasis on off-campus instruction
A Floriculture
B Nursery Crops
C Turfgrass
D Fruit Crops
E Vegetable Crops
F Cross Commodity

599 Creative Component Cr arr

*See page 119 for information on dual-listed courses

Courses for Graduate Students, major or minor

610 Graduate Seminar Cr 1 each time elected F S

690 Advanced Topics Cr var

696 Seminar in Plant Physiology and Molecular Biology (Bot 696) See *Botany*

699 Thesis and Dissertation Research Cr var
A Floriculture
B Nursery Crops
C Turfgrass
D Fruit Crops
E Vegetable Crops
F Cross-Commodity

Hotel, Restaurant, and Institution Management

Thomas E Walsh Head of Department

Associate Professors Baltzer Brown Gilmore Huss Walsh

Assistant Professors Burger Dana, Frederiksen, Hsu Kelley

Instructors Clubine Miskell Parrish Petersen, Simpson Snyder Strohbehn Thorius

Undergraduate Study

The Department of Hotel Restaurant and Institution Management is concerned with the professional management of organizations that provide food and lodging services to individuals and families away from home Educational experiences are planned to contribute to the graduate's effectiveness as a career professional and as a person family member and citizen Research and extension efforts are conducted with the purpose of improving the quality of services and the management effectiveness within lodging and foodservice organizations Finally the department is committed to serving the respective missions of Iowa State University and the College of Family and Consumer Sciences and to serving the needs of the state of Iowa

The department offers work for the degree bachelor of science in hotel restaurant and institution management with two options see *Family and Consumer Sciences Curricula*

The foodservice management option is planned to provide men and women with a general education plus professional preparation for the management of foodservices in organizations such as college and university residence halls and student unions elementary and secondary schools hospitals and long-term care facilities industrial plants and office buildings The curriculum prepares students for positions as foodservice directors

The hotel and restaurant management option provides in addition to a general education basic coursework to prepare men and women for supervisory and executive positions in the hotel and restaurant industry Principles of business management are presented as well as fundamentals of foodservice and lodging operations

Learning experiences are provided in the quantity food production and service facility of the Department of Hotel Restaurant and Institution Management The food and house administration departments of the university residence halls Holiday Inn-Gateway Center school foodservice systems and other approved establishments offer managerial experience to advanced students Field trips are planned to introduce students to the diversity of career opportunities in the hospitality industry Internships are available Students are required to have 400 hours of relevant work experience

The Department of Hotel Restaurant and Institution Management offers a minor This minor may be earned by successfully completing 16-17 credits as follows 380 380L 433 and 8-9 credits selected from HRIM courses in consultation with the designated faculty adviser

A foodservice management or hotel and restaurant management area of concentration can be combined with a major in journalism and mass communication in the College of Liberal Arts and Sciences See the department for details

The department requires a grade of C or better in both Engl 104 and 105 A student who does not get a C or better is required to get a C or better in Engl 302

Graduate Study

The department offers work for the degree master of science with a major in hotel restaurant and institution management and a minor to students taking major work in other departments

Prerequisite to major graduate work includes completion of basic principles courses in accounting computer science personnel management nutrition food preparation and quantity food preparation In addition the foodservice systems management option requires fundamental preparation in chemistry and microbiology and completion of four to five additional credits in hotel restaurant and institution management The hotel and restaurant management option requires completion of additional basic principles courses in economics business law management and marketing The program of study requires either a thesis or nonthesis (creative component) project The exact requirements will depend upon the field of work the student expects to pursue

Work may be taken for the degree doctor of philosophy as a joint major A second major must be chosen from family and consumer sciences education economics higher education or a related area offered by a department authorized to grant a doctoral degree

Open to graduate students for minor credit only 350 438 440 455 460 483

Courses Primarily for Undergraduate Students

[a]**287 Introduction to Management in Hospitality Occupations** (2 0) Cr 2 F Introduction to management concepts and principles with application to the hospitality industry Specific applications to business and industry are presented by representatives from the hospitality industry

288 Introduction to the Hotel Restaurant and Institution Industry (2-0) *Cr 2 S Prereq 287* Introduction to issues and operations of the various components of the HRI industry in service to individuals families and groups Emphasis on professional and management responsibilities Guest speakers

289 Private Club Operations (2-0) Cr 2 Alt F offered 1994 *Prereq 288* The organization and management of the various types of private clubs including city country and other recreational and social clubs Field trip required Field trip fee

350 Hotel Front Office Management (3 0) Cr 3 F *Prereq 287 Acct 284 Com S 103* Procedures of hotel front office operation including reservations registration posting and cashiering Principles of yield and room rate management Emphasis on manual night audit and computer based hotel information systems

380 Quantity Food Production Management (3 0) Cr 3 F S SS *Prereq FS HN 211 or 214 enrollment in 380L* Principles of management applied to quantity food production with emphasis on methods of preparing food in quantity quality control work methods menu planning sanitation and safety and food cost control

380L Quantity Food Production Management Experience (0 6) Cr 2 F S SS *Prereq FS HN 211 or 214 enrollment in 380 advance reservation with department required* Application of management to quantity food production through use of appropriate production and service methods

390 Study Tour Cr 1 S *Prereq Credit or enrollment in 380 junior classification in HRIM curriculum* Study tour of quantity foodservice and lodging units and related industries Offered on a satisfactory fail basis only Field trip fee

[a]**391 Foodservice Systems Management I** (3 0) Cr 3 F *Prereq Credit or enrollment in 380 380L* Principles and techniques related to basic management organizational leadership and personnel management of foodservices in health care and other institutional settings Not accepted for credit toward a major in HRIM

[b]**392 Foodservice Systems Management II** (3 0) Cr 3 S *Prereq Credit or enrollment in 380 380L* Introduction to financial management of foodservice departments procedures for controlling food labor and other variable costs Application of principles related to food product selection specification purchase and storage in health care and other institutions Not accepted for credit toward a major in HRIM

393 Hospitality Work Experience Cr 1 *Prereq Adviser approval* Approved work experience for HRIM majors in food lodging or related operations Experience in at least two different positions is required A minimum of 400 hours required Offered on a satisfactory fail basis only

[b*]**433 (533 DL) Hospitality Financial Management** (3 0) Cr 3 S *Prereq Credit or enrollment in 380* Financial information systems to control food labor beverage and other expenses Information needed for developing budgets analysis of income and expense statements and an introduction to financial ratios

[b*]**434 (534 DL) Food Purchasing** (3 0) Cr 3 F S *Prereq Credit or enrollment in 380 380L* Principles of food procurement and inventory management for foodservice systems Emphasis on specifications and factors affecting quality Application of menu planning principles to purchasing

***435 (535 DL) Layout and Equipment** (2 2) Cr 3 F *Prereq Credit or enrollment in 380 380L* Food facilities planning and design selection of equipment with emphasis on materials construction and specifications Field trips required Field trip fee

436 Experience in Foodservice Management (0-6) Cr 2 S *Prereq 380 380L enrollment in 392 admission to the Coordinated Undergraduate Program in Dietetics* Supervised experience in foodservice management Emphasis on management functions relating to areas of food production food safety quality control purchasing and personnel management in a university residence hall Open to HRIM majors with approval of instructor

437 Foodservice Management Information Systems (0-2) Cr 1 Alt F offered 1993 *Prereq 380 433 or 392 Com S 103* Introduction to computerized information systems used in restaurant and foodservice organizations Experience in developing applications for hospitality organizations using spreadsheet software

438 Personnel Management in Hotels Restaurants, and Institutions (3-0) Cr 3 F S *Prereq Credit or enrollment in 380 380L* Principles and practices used in the management recruitment and development of personnel Emphasis on the supervisor s role in hotels restaurants and noncommercial foodservice organizations

***439 (539 DL) Cases in Hotel Restaurant, and Foodservice Personnel** (3 0) Cr 3 F S *Prereq 438* Emphasis on the work force and work environment in hotels restaurants and noncommercial foodservice organizations Discussion and analysis of case studies

440 Hotel Restaurant and Tourism Marketing (3-0) Cr 3 F S *Prereq 287 Mkt 340* Application of marketing goals and strategies to the hotel restaurant and tourism industry toward individuals families and groups Discussion of case studies

450 Hotel and Restaurant Accounting (3-0) Cr 3 Alt S offered 1995 *Prereq 287 Acct 284* Accounting procedures applicable to hotels restaurants and clubs Emphasis on uniform systems of accounts ratio analysis internal control and cash management

455 Hospitality Operations Management (3-0) Cr 3 F *Prereq 287 380 380L 433 credit or enrollment in 438 Mkt 340 senior classification* Integration of management concepts in hospitality organizations Use of decision models and case studies

460 Legal Aspects of Hotel and Restaurant Management (2-0) Cr 2 S *Prereq Acct 215* Laws relating to ownership and operation of hotels restaurants and similar institutions The responsibility of management and employees to individuals families and groups

483 Lodging Management Experience (2 6) Cr 2 S Lab only first or last 8 weeks Lecture/recitation meets for 2 hours each 12 times throughout the semester *Prereq 350 438 460* Analysis and interpretation of management functions Experience at Holiday Inn Gateway Center or other approved establishments For HRIM majors only

***485 (585 DL) Catering** (2-0) Cr 2 F *Prereq 380 380L* Integration of management principles in a catering business Emphasis on production and service of quality food and beverages for special functions

***485L (585L DL) Catering Experience and International Cuisine** (0-4) Cr 2 F *Prereq 380 380L enrollment in 485* Creative experiences with U S regional and international foods appropriate for catered functions Application of management principles in preparation of and service for special functions Materials fee

490 Independent Study Cr arr *Prereq Sections A-D Approval of the department head Section H Full membership in Honors Program*
A Quantity Food Production
B Organization and Management
C General
D Housing or Lodging
H Honors

491 Internship Cr 2 *Prereq Department approval*
A Foodservice
B Lodging

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[a]Credit for either 391 or 287 and 438 may count toward graduation

[b]Credit for either 392 or 433 and 434 may count toward graduation

*See page 119 for information on dual listed (DL) courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Short Course Cr arr *Prereq 6 credits in hotel restaurant and institution management and permission of instructor*

***533 (433 DL) Hospitality Financial Management** (3-0) Cr 3 S *Prereq Credit or enrollment in 380* Financial information systems to control food labor beverage and other expenses Information needed for developing budgets analysis of income and expense statements and an introduction to financial ratios

***534 (434 DL) Food Purchasing** (3-0) Cr 3 F S *Prereq Credit or enrollment in 380 380L* Principles of food procurement and inventory management for foodservice systems Emphasis on specifications and factors affecting quality Application of menu planning principles to purchasing

***535 (435 DL) Layout and Equipment** (2 2) Cr 3 F *Prereq Credit or enrollment in 380 380L* Food facilities planning and design selection of equipment with emphasis on materials construction and specifications Field trips required Field trip fee

***539 (439 DL) Cases in Hotel Restaurant, and Foodservice Personnel** (3-0) Cr 3 F S *Prereq 438* Emphasis on the work force and work environment in hotels restaurants and noncommercial foodservice organizations Discussion and analysis of case studies

575 Comprehensive Professional Experience Cr arr F S SS *Prereq 9 credits in hotel restaurant and institution management at 400 level or above and permission of instructor* Analysis implementation and interpretation of professional functions to gain greater competency in selected areas of the hotel restaurant institution management industry or in an academic environment

580 Quantity Food Development (1 3) Cr 2 Alt S offered 1995 *Prereq 380 380L FS HN 214 or 411* Experimental approach to the development of quantity recipes Emphasis on sensory evaluation parameters of time equipment ingredients and reporting results

***585 (485 DL) Catering** (2-0) Cr 2 F *Prereq 380 380L* Integration of management principles in a catering business Emphasis on production and service of quality food and beverages for special functions

***585L (485L DL) Catering Experience and International Cuisine** (0-4) Cr 2 F *Prereq 380 380L enrollment in 585* Creative experiences with U S regional and international foods appropriate for catered functions Application of management principles in preparation of and service for special functions Materials fee

590 Special Topics Cr arr *Prereq 9 credits in hotel restaurant and institution management at 400 level or above and permission of instructor*
A Quantity Food Production
B Organization and Management
C General
D Housing or Lodging

593 Workshops Cr arr *Prereq 6 credits in hotel restaurant and institution management and permission of instructor*

599 Creative Component

Courses for Graduate Students, major or minor

601 Decision Optimization in Hotel Restaurant and Institution Management (3-0) Cr 3 Alt S offered 1995 *Prereq 4-6 graduate credits in hotel restaurant and institution management 3 credits each in accounting mathematics and statistics* Application of decision theory in restaurant foodservice and lodging systems using quantitative methods and models to optimize decisions

604 Seminar (0-2) Cr 1 F

608 Administrative Problems Cr arr *Prereq 9 credits in hotel restaurant and institution management at 400 level or above and permission of instructor* Consideration of advanced administrative problems Case studies in foodservice and housing departments of approved establishments

611 Hospitality Management Strategies (3-0) Cr 3 Alt S offered 1994 *Prereq 4-6 graduate credits in hotel restaurant and institution management and 3 credits each in accounting mathematics and statistics* Formulation implementation and control of strategic management activities in hospitality organizations Analysis of cases related to the hospitality industry

639 Management of Hotel Restaurant, and Institution Management Professionals (3-0) Cr 3 Alt F offered 1994 *Prereq 439 or 539* Theories of leadership and management applied to selected service institutions Principles and practices related to recruitment selection and development of professional foodservice personnel

699 Research

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*See page 119 for information on dual-listed courses

Housing

(Interdepartmental Graduate Minor)

Supervisory Committee R A Findlay Chair P Burgess, C Cook D L Fowles S G Koven J R Prescott

Work in the housing minor is offered for students pursuing the master of architecture master of arts master of community and regional planning master of fine arts master of landscape architecture master of science and Ph D degrees The cooperating departments are Anthropology Architecture Art and Design Community and Regional Planning Economics Family and Consumer Sciences Education and Studies Human Development and Family Studies Landscape Architecture Political Science Professional Studies in Education Sociology and Textiles and Clothing

A declared minor in housing consists of a minimum of nine semester credits in courses numbered 500 or above from a list of acceptable courses if the thesis is devoted to housing Otherwise 12 semester credits are required At least 6 of the 9 or 12 credits shall be in courses specifically focused on housing Courses from at least two of the cooperating departments shall be included In addition the student is encouraged to take at least one course in statistics or research methods Attendance at meetings of the housing colloquium is expected of students in the minor

The program of study committee of a student minoring in housing shall include a representative of the housing minor from the list of approved representatives The representative who shall not be from the student s major department shall be at least an associate member of the graduate faculty for a master s committee and a full member for a Ph D committee

Interested students may contact the chair of the supervisory committee for lists of the acceptable courses, the courses specifically focused on housing and the members of the faculty of the housing minor

Human Development and Family Studies

Dianne C Draper Chair of Department

Professors Cate, Clark Crase, Draper Hira, Joanning Lempers Mercier Stockdale Winter

Emeritus Professors Bivens Budolfson Coulson Deacon Engel Galejs Garfield Liston Meixner Petersen Pickett Schwieder Sunderlin

Associate Professors Allen Cole Cook Dail Fletcher Hegland, Herwig King Labensohn Martin McBride Meredith Molgaard Petersen, Rippie Strong Volker Yearns

Assistant Professors Brotherson Enders Garasky Graham Jacobson, McMurray-Schwarz Peterson Shaw Thieman

Undergraduate Study

For undergraduate curricula in human development and family studies leading to the degree bachelor of science see *Family and Consumer Sciences Curricula*

The Department of Human Development and Family Studies offers courses that focus on the interactions among individuals families their resources and their environments throughout the life span The department offers work for the bachelor of science degree in five curricula child and family services family resource management and consumer management housing and the near environment early childhood education and teaching prekindergarten and kindergarten children

The child and family services curriculum leads to work in the helping services with employment opportunities in public and private agencies Opportunities exist to observe and work with infants preschoolers school-age children adolescents the elderly and families Examples include child care community action community planning paralegal rehabilitation health care health services management and crisis intervention This flexible program provides a broad emphasis in theory research and application in child and family services including attention to community issues and public policy A student may seek a double major or preprofessional preparation

The family resource management and consumer sciences curriculum focuses on the behavior of families as they allocate and manage their resources and function as consumers The curriculum leads to employment with agencies and organizations concerned with family financial management financial counseling consumer economics and analysis and implementation of public policies that affect family resource management

The focus of the housing program is the effect of the socio-psychological economic political and physical factors on children families and their life events The curriculum in housing and the near environment focuses on housing needs issues and trends such as housing alternatives for families and children housing for the elderly and persons with disabilities residential property management and public policy Graduates of this curriculum are prepared for employment in housing-service public and private (profit and not-for-profit) agencies and organizations real estate and lending institutions housing management and administration the housing and furnishings industries and housing advocacy

The curriculum in early childhood education is available to students in the College of Family and Consumer Sciences or the College of Education This curriculum meets the Iowa teacher licensure standards for Birth through Third Grade

Students who complete the curriculum in teaching prekindergarten-kindergarten children may receive teaching licensure with an endorsement in prekindergarten-kindergarten teaching and may elect to pursue an additional endorsement in early childhood special education Students selecting either teaching option must apply to and be accepted in the University Teacher Education Program For additional teacher education requirements see *College of Education*

Students with a legal assistant associate in science degree can complete requirements for the family resource management and consumer sciences child and family services or housing and the near environment curriculum All credits from an approved legal assistant program will transfer in their entirety up to a maximum of 65 semester credits to any of these curricula Employment opportunities exist in law firms governmental agencies and private business

The department offers minors in family resource management and consumer sciences child and family services and housing and the near environment The department also offers journalism areas of concentration in child and family services housing and the near environment and family resource management and consumer sciences see department for details

The family resource management and *consumer sciences minor may be earned by* completing 15 credits in the following courses 102 215 283 378 448 483 488 489

The child and family services minor may be earned by completing 102 selecting 3 credits from 378 or 449 selecting 3 credits from 224 225 226 or 377 selecting 3 credits from 276 349 360 378 370 or 373 and selecting 3 credits from 340 343 391 and 479

The housing and the near environment minor may be earned by completing 9 credits in the following courses 210 239 254 and 6 credits from the following courses 341 360 416 446 462 463 490B

English proficiency requirement A student must achieve a grade of C or higher in English 104 and 105 A student achieving a grade of C– or lower in 104 will be required to repeat the course and earn a grade of C or higher A student achieving a grade of C– or lower in 105 must either repeat 105 earning a minimum grade of C or, in consultation with the adviser and the coordinator of freshman English complete another appropriate English writing course with a minimum grade of C

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with the major in human development and family studies and minor work for students taking major work in other departments

Within the major of human development and family studies students may choose from different specializations Specializations are available for both M S and Ph D candidates in child development early childhood education family resource management and housing, family studies and life-span studies M S candidates may specialize in early childhood special education, Ph D candidates may specialize in marital and family therapy The marital and family therapy specialization is accredited by the Commission on Accreditation for Marriage and Family Therapy Education The Department of Human Development and Family Studies offers coursework and experiences leading to National Council of Family Relations certification as a family life educator

The department cooperates in the interdepartmental minors in technology and social change housing and gerontology

Prerequisite to work in the major is the completion of a related undergraduate program with basic courses in one or more of the following areas child/human development family studies education psychology sociology and economics Additional prerequisites if any depend upon the area of specialization

Guidelines for graduate programs of study in human development and family studies have been developed However the student s program of study committee has the major responsibility for determining requirements for an individual program

Open to graduate students for minor credit *only 443 446 448 449 455 456 462 463* 479 483 488 489

Courses Primarily for Undergraduate Students

102 Individual and Family Life Development (3 0) Cr 3 F S SS Development of individuals families and their reciprocal relationships as affected by external factors examined within a framework of life span developmental tasks

210 Home Furnishings for Consumers Across the Life Span (3-0) Cr 3 F Consumer analysis of home furnishing needs across the life span Selection process for home furnishings with emphasis on types quality safety and maintenance considerations Appropriate furnishings for various lifestyles including children the elderly disabled and low income families Criteria for consumers to employ in evaluating furnishings and in child care institutional and home settings

215 Families as Consumers *(3-0) Cr 3 F S The* family s relationship to the consumer movement consumer rights and responsibilities consumer issues consumer power in the marketplace legal considerations in purchasing products and services and consumer protection

218 Human Development and Family Studies Study Tour Cr 1 F S *Prereq 102* The process of professional development and the scope of professional responsibilities in human development and family studies Study of and visits to programs that serve children and families with diverse needs Field trip fee Offered on a satisfactory fail basis only

224 Development and Guidance in Infancy (2 2) Cr 3 F S SS *Prereq 102 or Psych 230* Developmental characteristics of infants from the prenatal period through two years of age Development in the contexts of family program and society Guidance of infants and toddlers within family and group care settings Participation with infants

225 Development and Guidance in Early Childhood (2 2) Cr 3 F S SS *Prereq 102 or Psych 230* Developmental characteristics of children from 2 to 6 years of age Development in the contexts of family program and society Guidance within family

and group care settings Directed observation and participation with preschool and kindergarten children

226 Development and Guidance in Middle Childhood (2 2) Cr 3 F S SS *Prereq 102 or Psych 230* Developmental characteristics of children from 5 to 12 years of age Development in the contexts of family school and society Guidance of children in family and group settings Directed observation and participation with children

239 Housing Environments for Children and Families (3-0) Cr 3 S Physical cultural economic socio psychological and political conditions that affect the housing needs of children individuals and families Factors related to differences in needs across the life span in a variety of settings such as child care institutions and planned housing

240 Literature for Children (3 0) Cr 3 F S SS *Prereq 102 or Psych 230* Evaluation of literature for children Roles of literature in the total development of children Literature selection and use

254 Equipment in the Home (3 0) Cr 3 F Utilization of water electricity gas light and heat for doing work and maintaining health safety and comfort in the home environment Selection and use of appliances as related to consumer needs interests and resources Application of basic physical science principles

255 Young Children with Special Needs (2 2) Cr 3 F S *Prereq 224 or 225* Characteristics of young children with special needs in the areas of physical cognitive behavioral and communication development Focus on exceptional development from birth to five years including giftedness and developmental disabilities Familial educational and legal implications Participation with children with special needs

269 Research in Human Development and Family Studies (3-0) Cr 3 S *Prereq 102 or Psych 230* Understand and evaluate research Use of primary and secondary data to identify and study problems related to human development and family issues including finance and housing An introduction to statistical concepts and computer analysis Research participation

276 Human Sexuality (3-0) Cr 3 F S Behavioral biological and psychological aspects of human sexuality within the social context of family culture and society Role of sexuality in human development Critical analysis of media and research Communication and decision making skills relating to sexuality issues and relationships

283 Family Financial Management (3-0) Cr 3 F S SS Basic principles of money management Budgeting record keeping checking and savings accounts consumer credit insurance investment taxes

310 Developmental Assessment of Children (2 0) Cr 2 F S *Prereq 224 or 225 255* Current practices for developmental assessment of young children for program planning Familiarity with norm referenced criterion referenced and observational assessment strategies

310L Developmental Assessment of Children Laboratory (0-2) Cr 1 F S *Prereq Concurrent enrollment in 310* Experience in team assessments of young children with disabilities Application of ecobehavioral criterion referenced and norm-referenced assessments

317 Field Experiences Cr arr F S SS Consult department office for procedure Supervised field experience in child development programs May be repeated

- A **Early Childhood Education Programs** *Prereq 343*
- B **Youth/Community Services** *Prereq 343*
- C **Early Childhood Special Education Programs** *Prereq 255*
- D **School Age Child Care Programs** *Prereq 226*
- E **Infant/Toddler Program** *Prereq 340*
- F **Research** *Prereq 269 permission of instructor*

340 Programming for Infants and Toddlers (2 2) Cr 3 F S *Prereq 224* Principles of evaluation and selection of activities materials and daily schedules for infants and toddlers Learning environments teaching strategies health practices and daily routines appropriate for individuals and groups Development implementation and evaluation of activity plans

341 Housing Finance (3-0) Cr 3 F *Prereq 239* Personal and family financial considerations in home ownership rental and home improvements The social economic and governmental contexts of financial decision making at the household level Materials fee

343 Activities and Materials for Early Childhood Education (2 2) Cr 3 F S SS *Prereq 225* Principles of evaluation and selection of activities and materials for preschool and kindergarten children Designing learning environments and teaching strategies appropriate for individuals and groups Development implementation and evaluation of activity plans

349 Parenting and Family Issues (3-0) Cr 3 F S *Prereq Sophomore classification* Important social issues that affect human relations within the family as well as the relationship of the family to the larger society Parenting roles and practices Current issues with appropriate multicultural examples including child care nontraditional parenting situations adolescent sexuality and family violence

353 Programming for Children with Multiple Disabilities (3 0) Cr 3 S *Prereq 255 or El Ed 250* Adapting programs to the individual needs of young children with multiple handicaps or specialized health care needs Familiarity with and use of positioning handling feeding techniques adaptive equipment and health care procedures Demonstrations observation and guided participation

360 Housing Services for Families with Special Needs (3 0) Cr 3 S SS *Prereq 239* Strategies to assist families and individuals with special needs Public and private (profit and not for profit) housing service implementation schemes Emphasis on experimental and innovative approaches at local state and federal levels Field trips Fee

367 Abuse in Families (3-0) Cr 3 S *Prereq 9 credits in social sciences* Causes and consequences of physical sexual and emotional abuse in families across the life cycle Interplay between victims offenders and the treatment system Mandatory reporter training certification available

370 Communication in Human and Family Development (3-0) Cr 3 F S SS *Prereq 3 credits in social sciences* Application of communication processes in human and family development Development maintenance enrichment and change in family personal and professional relationships through the life span

373 Death as a Part of Living (3-0) Cr 3 F S SS *Prereq 102* Consideration of death in the life span of the individual and the family with opportunity for exploration of personal and societal attitudes Field trip fee

377 Aging and the Family (Geron 377) (3 0) Cr 3 F SS *Prereq 102* Interchanges of the aged and their families Emphasis on role changes social interaction and independence as influenced by health finances life styles and community development

378 Family and Management Patterns (2 1) Cr 3 F S SS *Prereq 102 Soc 134* The use of systems theory and family development theory in understanding family behavior including the management of family resources across the family life cycle to achieve family goals

380 Family Law (3 0) Cr 3 S *Prereq Junior classification* Family relationships rights and duties as prescribed by law Investigation of sources and interpretations of law Materials fee

391 Family and Community Assessment (3-0) Cr 3 F S *Prereq 269 Stat 101 6 credits in human development and family studies psychology or sociology junior classification* Assessment of families community needs and functions and the impact of public policy on families Characteristics of successful community-based family intervention and support programs Strategies and skills needed by community based professionals grantsmanship

416 Human Development and Family Studies Seminar Cr var F S SS *Prereq 8 credits in human development and family studies* Intensive study of a selected topic in human development and family studies

417 Supervised Student Teaching Cr 8 Reservation required
A Kindergarten Programs F S *Prereq GPA 2 5 full admission to teacher education program 443 449 enrollment in 417B or 417C* Teaching experience with kindergarten children
B Preschool Programs F S SS *Prereq GPA 2 50 full admission to teacher education program 449 or El Ed 447* Teaching experience with young children from birth to 5 in group settings
C Early Childhood Special Education Programs F S *Prereq GPA 2 5 full admission to teacher education program 449 455 enrollment in 417A* Teaching experience with preschool children with disabilities

***437 (537 DL) Characteristics of Giftedness** (Psych 437) (3-0) Cr 3 S SS *Prereq 9 credits in human development and family studies or psychology including Psych 230 or HD FS 102 senior classification* Understanding of giftedness and talent from cognitive developmental and social perspectives using a life span approach Current conceptualizations and research regarding gifted children and adults Implications for education and guidance

443 Curriculum Planning for Early Childhood (3-0) Cr 3 F S *Prereq 343* Examination and evaluation of program models and methods leading to development and organization of appropriate curricula for early childhood programs Evaluating and designing curricula applying principles of development and appropriate teaching strategies

445 Administration of Programs for Children (3-0) Cr 3 F *Prereq 343* Management principles and techniques involved in programs for young children including an introduction to financial management Emphasis on government regulations concerning child care personnel management community relations and child care advocacy

446 Housing Alternatives Management Across the Life Span (3-0) Cr 3 F *Prereq 239* Meeting human needs across the life span through alternative housing forms Emphasis on elderly low income minorities single-parent families dual career families and young adults influenced by economic social technological and physical factors Field trip fee

448 Economics of Aging (Econ 448 Geron 448) (3-0) Cr 3 Alt S offered 1994 *Prereq 3 credits in principles of economics 3 credits in human development and family studies* Economic status of the aging retirement planning and the retirement decision role of Social Security public transfer programs for the elderly intrafamily transfers to/from the elderly private pensions financing medical care and housing for the elderly prospects and issues for the future

449 Family Analysis and Planned Change (3 0) Cr 3 F S *Prereq 102 or Psych 230* Application of theory and methods to the analysis of family strengths and needs across the life span Identifying family needs and resources Interrelationships among specializations in the profession Linking families to community resources

455 Curricula for Early Childhood Special Education (2 2) Cr 3 F *Prereq 310L 343 353* Development and implementation of individualized education plans for young children with special needs Play based curriculum planning for center-based programs Integrated practicum setting

456 Programming in Early Intervention (2 2) Cr 3 S *Prereq 310 310L 353* Application of family systems theory in family focused service delivery models Assessment-based intervention strategies for infants and toddlers with disabilities and their families Field experience in home-based programs

462 Human Factors in Housing Interior Spaces (2-2) Cr 3 S *Prereq 6 credits in housing art and design or architecture* Criteria for planning of housing interior spaces Application of human engineering principles for effective functioning in work areas Emphasis on economy resource conservation and space planning Materials fee

463 Designing Spaces for the Disabled Geron 463) (3-0) Cr 3 F *Prereq 360 or 3 credits in housing architecture interior design rehabilitation psychology or human development and family studies* Emphasis on independent living within residential and public spaces for all ages Application of criteria appropriate for accessibility and functional performance of activities Work with professionals to plan and evaluate special projects Field trip Materials fee

479 Family Interaction Dynamics (3-0) Cr 3 F *Prereq 378* Analysis of family interaction processes and patterns with emphasis on relationship dynamics across the family life span

483 Advanced Family Financial Management (3-0) Cr 3 F S *Prereq 283* Managerial approaches to achievement of short- or long term financial goals for households Investigation of different forms of investments and investment risks management in financing current and future consumption Analyses of tax estate and retirement planning needs of the family

488 Family in the Economy (3-0) Cr 3 S *Prereq Econ 201 or 205 and 206* Analysis of the family as an economic unit in society Structure and composition of the family Patterns of resource use and activities pursued by the family Family economic transitions such as marriage divorce and childbirth

489 Family Financial Counseling (3-0) Cr 3 F *Prereq 483* Personal social/psychological and legal climates affecting family financial decisions Development of financial counseling and planning skills to assist families and individuals to become self sufficient in family financial management

489L Laboratory in Family Financial Counseling (0 2 or 0-4) Cr 1 2 F S *Prereq 489* Experience in remedial preventive and productive financial counseling

490 Independent Study Cr arr *Prereq 6 credits in human development and family studies* Consult department office for procedure

A Child and Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
H Honors
I Human Development and Family Studies
R Research

491 Practicum Cr 8 F S SS Arr *Prereq 391 449 permission of instructor Reservation required one semester before placement* Supervised work experience off campus related to the student s curriculum Offered on a satisfactory/fail basis only

***493 (593 DL) Workshop** Cr arr F S SS *Prereq Senior classification*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Short Course Cr arr *Prereq Permission of instructor* Concentrated group study of various developmental and educational issues in the field of human development and family studies

501 Graduate Study Orientation (1-0) Cr R F Orientation to graduate study and current research in the department

502 Theories of Human and Family Development (3 0) Cr 3 F S SS *Prereq 6 credits of social sciences* Theoretical approaches and current research in child adolescent adult and family development Family systems individual life span and family life-cycle perspectives

503 Research Methods in Human and Family Development (3-0) Cr 3 S *Prereq 9 credits in social sciences* Concepts methods and strategies for research in human and family development Topics include the nature of scientific research measurement types of socio-behavioral research validity of research designs methods of data gathering and strategies for and issues in the study of change

503L Research Methods Laboratory in Human and Family Development (0 3) Cr 1 F S *Prereq Credit or enrollment in 503 2 to 3 credits in statistics* Coding entry and manipulation of research data in studies of human and family development Practical applications with interactive statistical and word processing computer packages

519 Consumer Dynamics (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in human development and family studies 6 credits in economics* Consumer roles in the evolution of economic society Analysis of consumer interactions with public and private institutions serving consumer interests Emphasis on process of consumer decision making

521 Housing and the Social Environment (3 0) Cr 3 F *Prereq 502 or 6 credits in social sciences* Housing adjustment behavior of individuals and families in the context of the social and cultural framework of society Impact of housing onthe family

522 Time and Human Resources (3 0) Cr 3 Alt S offered 1994 *Prereq 6 credits in human development and family studies 6 credits in economics at least 3 of which are in microeconomics* Conditions programs and policies related to development and allocation of human resources and time the role of families and households in the production of human capital goods and services impact of public policies and the economy on families capacities to develop utilize and allocate resources throughout the life-span

523 Management within the Family (3 0) Cr 3 Alt F offered 1993 *Prereq 378 6 credits in sociology or economics* Theoretical development and research related to the use of family resources to achieve family goals Emphasis on systems theory as applied to family management

525 Theories and Research in Early Childhood Education (3-0) Cr 3 S SS *Prereq 502 or 6 credits in social sciences* Analysis of contemporary and historical models including early intervention programs The effect of variables such as programming physical environment and teacher effectiveness on children Research on teacher-child and teacher parent interactions in early childhood education programs

534 Adult Development (3 0) Cr 3 Alt S offered 1994 *Prereq 502* Adult development of cognition personal characteristics and cultural aspects of human relationships Emphasis on development and psychosocial health in young middle and later adulthood

***537 (437 DL) Characteristics of Giftedness** (Psych 537) (3 0) Cr 3 S SS *Prereq 9 credits in human development and family studies or psychology including Psych 230 or HD FS 102 senior classification* Understanding of giftedness and talent from cognitive developmental and social perspectives using a life span approach Current conceptualizations and research regarding gifted children and adults Implications for education and guidance

538 Developmental Disabilities in Children (Psych 538) (3-0) Cr 3 S *Prereq 9 credits in human development and family studies or psychology* Theories research and current issues regarding development in children with disabilities Investigation of interventions with children and families

547 Parent-Child Relations (3 0) Cr 3 F alt SS offered 1995 *Prereq 502 or 6 credits in social sciences* Analysis of theories and research related to parent-child interactions examination of parenting as a developmental process Current issues in child rearing

548 Parent Education (3 0) Cr 3 S Alt SS offered 1994 *Prereq 502 or 6 credits in social sciences* Needs assessments models delivery systems and evaluation procedures used in parent education programs for families with diverse needs including single parents adolescent parents and parents of children with developmental disabilities Developmental aspects of parenting Effects of values family structures family goals and parenting styles on parent education

566 Impact of Public Policy on the Family (3-0) Cr 3 Alt S offered 1995 *Prereq 9 credits in social sciences* The effect of legislative policy on the family Explicit and implicit family policies in other nations contrasted with policies affecting American families Specific legislation analyzed by family impact analysis

567 Family Violence (3 0) Cr 3 F *Prereq 9 credits in social sciences* Contemporary theory and research in family violence Emphasis on societal and interpersonal factors that influence intrafamilial abuse Implications for intervention and public policy

568 Advanced Developmental Assessment (3 0) Cr 3 F *Prereq 502* Procedures and issues related to developmental assessment with children and their families Theory research and application of formal and informal methods of assessment Focus on young children and their families including those with special needs

570 Families Across the Life Cycle (3-0) Cr 3 F *Prereq 9 credits in social sciences* Theory and research in development and change in family systems and in their reciprocal relationships with the individual and the environment across the family life cycle

571 Marital and Family Intervention (2 1) Cr 3 F *Prereq 12 credits in social sciences* Survey of marital and family therapy approaches to individual and family problems with primary attention on transgenerational and experiential theories and techniques

572 Stress and Family Crisis Intervention (3 0) Cr 3 Alt S offered 1994 *Prereq 9 credits in social sciences* Introduction to family stress theory stress management and coping strategies Emphasis on practical application of theoretical concepts

573 Ethics and Professional Studies in Marriage and Family Therapy (3-0) Cr 3 Alt S offered 1994 *Prereq 571* Professional ethics and family law relevant to family therapy review of professional organizations private practice and grant writing

575 Cross cultural Perspectives on Children Youth and Family Life (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in social sciences* Review of methods and results of cross cultural research on the development of children and youth Cultural influences in individual and family development Comparison of child rearing practices family roles values and traditions in contrasting cultures

577 Aging and Intergenerational Relations (Geron 577) (3-0) Cr 3 Alt S offered 1994 *Prereq 9 credits in social sciences* Personal and family adjustments to role changes in later life that affect older persons and their adult children

579 Theories and Research in Family Studies (3 0) Cr 3 S *Prereq 9 credits in social sciences* Current research and theoretical perspectives in family studies including family dynamics family and change and family problems

580 The Family and the Law (3 0) Cr 3 Alt F offered 1993 *Prereq 215 or 483 or Acct 215* The effects of selected legislation and cases on individuals and families The legal processes involved in the activities of individuals and families Implications for effective functioning within the limits of the legal environment Legal and quasi legal services available in the community Field trip fee

588 Family Economics (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in sociology and economics* Analysis of family income wealth and economic well being Emphasis on effects of family behavior

and public policies on the adequacy and security of income across the family life cycle Implications of resource allocation within the family for adult and child well being

589 Advanced Family Financial Counseling (3-1) Cr 3 Alt F offered 1994 *Prereq 489 or 571 or 9 credits in sociology or psychology* A life cycle approach to financial decision making Theoretical development and research related to socio-psychological aspects of money behavior Application to marriage and family therapy and family financial counseling Opportunity to observe counseling sessions involving financial issues

590 Special Topics Cr arr *Prereq Permission of instructor Consult department office on procedure for filing a written plan of study*
A Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
I Human Development and Family Studies
M Marital and Family Therapy

591 Practicum Cr arr F S SS *Prereq 10 graduate credits* Supervised experience in an area of human development and family studies
A Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
I Human Development and Family Studies
M Marital and Family Therapy

***593 (493 DL) Workshop** Cr arr F S SS *Prereq Senior classification*

*See page 119 for information on dual listed (DL) courses

Courses for Graduate Students, major or minor

603 Advanced Quantitative Methods (3 0) Cr 3 S *Prereq 503 503L Stat 402 403 or 404* Methodological and analytical issues in research in human development and family studies Advanced research design and measurement selection of statistical techniques and issues in the interpretation of findings

604 Advanced Qualitative Research (3-0) Cr 3 F *Prereq 503* An advanced qualitative research methods course that builds on 503 Qualitative methods and related theory commonly used by researchers in family therapy human development and family studies Epistemology grounded theory ethnomethodology hermeneutics oral life stories and content analysis

616 Seminar Cr arr F S SS

621 Theory and Research in Family Housing (3-0) Cr 3 S *Prereq 521* Focus on current issues in housing families and individuals Emphasis on the methodological approaches and theoretical frameworks employed in housing research Assessment of psychological social physical economic and political factors affecting family housing quality

630 Adolescent Development (3-0) Cr 3 Alt S offered 1994 *Prereq 502 503* Theory and research on physical motor intellectual cognitive and social personality development from early to late adolescence Sources of developmental and individual differences in identity formation and attainment

631 Learning and Cognitive Development in Children (3-0) Cr 3 Alt F offered 1993 *Prereq 502* Theory and research emphasizing Piagetian psychometric and information processing approaches to cognitive development Concept memory and problem solving development Sources of individual differences in cognitive functioning of children and adolescents

632 Language and Perceptual Development in Children (3-0) Cr 3 Alt F offered 1994 *Prereq 502* Models of perceptual development Research methods and findings Theories and research on language development Role of perceptual strategies in the language learning process

633 Social and Emotional Development in Children (3 0) Cr 3 Alt S offered 1995 *Prereq 502* Theory and research related to social and emotional development of infants children and adolescents Dynamic socialization processes involving children adolescents parents peers and society

650 Advanced Family Economics Theory (3-0) Cr 3 Alt S offered 1995 *Prereq Econ 301 and 588* Analysis of theories research and current issues related to family and household economics Emphasis on theory development and empirical analyses of macro and micro family economic problems Future economic and social trends and their meaning for the family as an economic institution

672 Marital Therapy (3-0) Cr 3 F *Prereq 12 graduate credits in social sciences* Theories and techniques of marital therapy across the life cycle

673 Interactional and Systemic Family Therapy (3-0) Cr 3 Alt S offered 1995 *Prereq 571 672* An in-depth review of the Interactional (MRI) and Systemic (Milan) models of family therapy Also reviews similar models based on these two pioneer approaches Application of models in clinical practice

674 Structural and Strategic Family Therapy (3 0) Cr 3 Alt F offered 1993 *Prereq 571 or 672* Application of structural and strategic models of family therapy in clinical practice

676 Family Therapy (3 0) Cr 3 S *Prereq 571* Application of family and counseling theory to the process of therapeutic intervention with families Emphasis on systems dynamics throughout the family life cycle

678 Advanced Theories of Human and Family Development (3 0) Cr 3 F *Prereq 502 503* Current advanced theories and perspectives in human development and family studies Topics include theory construction and evaluation advanced life span theories longitudinal approaches advanced family theories and socio-historical perspectives

679 Cybernetics of Cybernetics (3-0) Cr 3 Alt F offered 1994 *Prereq 676* Constructivism as a theoretical paradigm Second order cybernetics and languaging systems as metaphors for therapeutic practice

690 Advanced Topics Cr arr *Prereq Permission of instructor and enrollment in Ph D program*
A Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
I Human Development and Family Studies
M Marital and Family Therapy

691 Internship Cr arr F S SS *Prereq Permission of instructor* Offered on a satisfactory/fail basis only Supervised practice and experience in the following specified areas
A College Teaching
B Research
C Marital and Family Therapy

692 Family Therapy Supervision (3 0) Cr 3 Alt S offered 1994 *Prereq 691C* Preparation of marital and family therapy supervisors

699 Research Cr arr Offered on a satisfactory/fail basis only
A Family Studies
B Housing
C Family Resource Management
D Human Development
E Child Development
F Early Childhood Education
G Early Childhood Special Education
I Human Development and Family Studies
M Marital and Family Therapy

Immunobiology

(Interdepartmental graduate program administered by the Department of Microbiology, Immunology and Preventive Medicine)

Program Committee M J Wannemuehler Chair J E Cunnick S J Lamont E A Nystrom D L Reynolds R W Griffith *ex officio*

Graduate Study

Work is offered for the degrees master of science and doctor of philosophy with a major in immunobiology Facilities and qualified staff exist in such areas as immunogenetics cell-mediated immunity immunochemistry immunocytology immunopathology microbial immunology and serology

Students planning to major in immunobiology must have a bachelor s degree or equivalent and qualify for admission to the Department of Microbiology Immunology and Preventive Medicine (MIPM) A strong background in biological sciences is recommended including work in immunology genetics and biochemistry Submission of scores on the GRE General Test is required and the GRE Biology Subject Test is recommended

Immunobiology students should include in their program of study a core of courses which will provide a broad coverage of the basic program in immunobiology Formal courses in immunology biochemistry and statistics are required Students selecting immunobiology as a major are allowed great latitude in selection of coursework and are well prepared for careers in a variety of areas A full list of courses is presented with the MIPM departmental listing Additional information concerning the immunobiology program is available from the MIPM department office

Industrial Education and Technology

John C Dugger III Chair of Department

Professors Miller Riley Wolansky

Emeritus Professors Howe Parks Sherick Wiener

Associate Professors Beno Dugger McKay Paige Smith Van Ast

Emeritus Associate Professors Weber

Assistant Professors Akinkuoye Bortz Bradshaw Drake Johnson Meier Merrell Zeimet

Undergraduate Study

For the undergraduate curriculum in industrial technology leading to the degree bachelor of science see *College of Education Curricula*

The industrial technology curriculum provides preparation for employment in industry or business in manufacturing (quality production supervision etc) occupational safety (safety specialist engineer etc) or training and development (technical trainer training coordinator instructor etc)

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with major in industrial education and technology and minor work for students taking major work in other departments Within the industrial education and technology major a student may specialize in industrial technology education industrial technology industrial vocational-technical education or training and development

Prerequisite to major graduate work is preparation equivalent to the completion of the undergraduate curriculum in industrial *education and technology at Iowa State* University and adequate proof that the student ranks above average in scholastic ability

Although the department stipulates no foreign language requirement for either the master of science or doctor of philosophy degree it may be relevant in individual cases to specify competence in one or more languages Students not electing the thesis option at the master s degree level will be required to complete a minimum of 3 credits of a creative component project

The department participates in the interdepartmental minor in technology and social change and with the departments of Agricultural Education and Studies Family and Consumer Sciences Education and Studies and Professional Studies in Education

Industrial Education and Technology (IEd T)

Courses Primarily for Undergraduate Students

110 Introduction to Industrial Technology (1 0) Cr R F S *Qualifications opportunities preparation* and duties of personnel in the field of industrial technology Specific information about the three options manufacturing technology training and development and occupational safety Philosophy structure and goals of the department Satisfactory fail Materials fee

120 Introduction to Graphic Communications (1-4) Cr 3 F S An introduction to the technical language of mechanical drawing and 35mm photography Laboratory experiences develop basic drafting competency and exposure development and printing of black and white photographs Materials fee

130 Introduction to Non metallic Manufacturing Materials and Processes (1 6) Cr 3 F S An introduction to selected industrial materials used in manufacturing Laboratory and lecture activities focus on the understanding of thermal chemical electrical and mechanical properties of industrial materials Materials fee

140 Introduction to Electrical Energy (1 4) Cr 3 F S *Prereq Math 142* Introduction to sources transmission and utilization of electricity DC and AC circuit theory amplifiers test instruments and tools Materials fee

216 Computer Applications in Industrial Technology (2-2) Cr 3 Provides a working knowledge of microcomputers and their application in industrial technology Emphasis on C programming language

221 Introduction to Graphic Reproduction (1-4) Cr 3 F S *Prereq 120* Concepts methods and industrial applications of transferring images and various substrates Photography as applied in industrial product decorating labeling and finishing Materials fee

224 Industrial Design Graphics (1-4) Cr 3 *Prereq 120* Industrial applications and practices of technical graphics Includes geometric tolerancing advanced visualizations revolutions basic machine design and computer graphics Materials fee

231 Introduction to Metallic Materials and Processes (1-6) Cr 3 F S *Prereq 130* A study of selected manufacturing processes used in industry Lecture and laboratory activities focus on understanding and applying process parameters Materials fee

240 Fundamentals of Electronics (1-4) Cr 3 F S *Prereq 140* Transistor circuits operational amplifiers oscillators modulation/demodulation AM receivers and digital circuits Materials fee

242 Industrial Electronic Applications (2 2) Cr 3 *Prereq 240* Conversion transmission control of electrical energy emphasis on practical industrial applications Materials fee

244 Integrated/Mechanical Fluid Systems (1-4) Cr 3 *Prereq 240* Modern mechanical/fluid power systems Emphasis on control and utilization Materials fee

246 Digital Electronics (2 2) Cr 3 F S *Prereq 240* Analysis and application of logic gates number systems and codes Boolean algebra counters shift *registers memories flip flops multivibrators* interfacing and data transmission Materials fee

302 Introduction to Training and Development in Industry and Business (3 0) Cr 3 An overview of the training profession in industry and business Training analysis design development implementation and evaluation Materials fee

303 Industrial Training Needs Assessment (3 0) Cr 3 S *Prereq 306* The importance of a needs assessment prior to conducting training Framework *for linking training and performance various approaches* to determining training needs Materials fee

305 Development of Industrial Training Curriculum (3-0) Cr 3 F *Prereq 303* Components fundamental to the development of effective industrial training curricula Training plan development course descriptions training task/content analysis performance objectives instructional sequence lesson planning and training assessment/evaluation techniques Materials fee

306 Human Resource Development in Industry and Business (3 0) Cr 3 S *Prereq 302* Theory and practice of contemporary applications of HRD programs training and development functional strategies for designing and developing training programs application of methods techniques and resources in the context of changing needs technological demographics and economic circumstances that create the need for additional workplace skills and knowledge Materials fee

316 Advanced Computer Applications in Industrial Technology (2-2) Cr 3 *Prereq 140 216* Data structures file input and output operations and digital electronics as they apply to the monitoring and control of manufacturing processes robotics and other industrial systems

322 Descriptive Geometry (1-4) Cr 3 *Prereq 224* A graphical analysis of spatial relationships between points lines and planes Materials fee

326 Computer-Aided Design (1-4) Cr 3 *Prereq 224* Study of common characteristics of computer-aided design systems through the use of microcomputers Includes 2 and 3-dimensional modeling using AutoCAD Materials fee

330 Polymer and Composite Processing (1-4) Cr 3 F S *Prereq 130* Design and production considerations of separating joining forming and conditioning of plastics A study of plastic properties and their relationship to processing parameters and control techniques Materials fee

336 Automated Manufacturing Processes (1-4) Cr 3 F S *Prereq 231 326* Automated machine tool operation emphasis on advanced set ups and processing parameters of machine tools including precision grinding NC CNC EDM CAD/CAM work cell and related processes and control techniques Materials fee

342 Solid State Industrial Electronics (2-2) Cr 3 *Prereq 240* Communications and control systems Power supply regulation digital and analog circuits fiber optics Materials fee

346 Energy Systems Assessment (1-4) Cr 3 *Prereq 240* Survey of energy sources control storage transmission and utilization in modern energy systems Materials fee

360 Total Quality Improvement (3 0) Cr 3 F S *Prereq Stat 101 junior classification* Application of the Deming methodology to establish a defect prevention system for any type of work activity Focus on customer participative management through teamwork emphasis on continuous improvement application of SPC methods using the Gelina problem solving model Materials fee

380 Supervised Industrial Cooperative Experience Cr 1 F S SS *Prereq Junior classification in industrial education permission of cooperative coordinator* Supervised work experience in industry

402 Industrial Training Delivery Techniques (3-0) Cr 3 F *Prereq 305* Various training delivery techniques and their teaching effectiveness Application of learning theory and curricular development skills Preparation for practice and review of student instruction Materials fee

405 Industrial Training Program Evaluation (3-0) Cr 3 S *Prereq 402* Developing techniques for evaluating training effectiveness Designed to provide skill development with both written and performance measures as well as techniques for refining and improving various measurement tools Materials fee

406 Industrial Training Media Resource Development (2 2) Cr 3 S *Prereq 305* Techniques related to the design development and application of various media used in training and development environment in industry and business Printed materials audiovisual computer managed instruction and interactive multimedia equipment Materials fee

410 Facility Planning (3-0) Cr 3 Principles and practices in designing evaluating and organizing existing facilities purchasing materials and maintenance of equipment Materials fee

423 Statics and Strength of Materials for Industrial Technology (1-4) Cr 3 *Prereq 224 Phys 111* Application of graphic and analytic techniques of solving problems related to force The properties of materials and how to use them Materials fee

433 Materials Testing and Processing (2-2) Cr 3 F S *Prereq 231* Materials testing and analysis relating to manufacturing processes Materials fee

435 Computer Automated Manufacturing Systems (1-4) Cr 3 F S *Prereq 216 242 326* Principles and concepts required for implementation of automated production techniques used in industry Computer technology hardware and software as tools to improve production and control needs Materials fee

442 Microprocessor Electronics Applications (2 2) Cr 3 *Prereq 240 316* Current electrical/electronic circuitry with emphasis on microcomputer systems design fabrication testing applications Materials fee

444 Transportation Systems (1-4) Cr 3 *Prereq 245* Analysis of energy conversion systems and isolated systems monitoring of integrated and isolated systems with test instruments calibration of components on mock up and live laboratory equipment Use of tools and test equipment to meet manufacturers and governmental specifications Materials fee

446 Industrial Robotics Systems (2 2) Cr 3 *Prereq 242 246* Controls and applications of *industrial robotics controls and automated systems* technology Classroom and laboratory experiences with hydraulic pneumatic electric/electronic components and systems Materials fee

481 Internship Cr 1 to 4 *Prereq 18 semester hours in industrial education and technology*

Internship designed for practical work exposure in an industrial setting

490 Independent Study in Industrial Technology and Training 1 to 5 credits *Prereq Senior classification quality-point average of 2 5 or more for two preceding semesters and 20 semester hours in industrial education and technology*
B Professional Methods
C Curriculum
D Drafting Design Planning
E Electricity Electronics
F Instructional Methods
G Technical Training
H Honors
M Metals
P Power
R Plastics
S Safety
W Wood Technology

493 Workshop in Industrial Technology and Training Cr 1 to 4 *Prereq 15 credits in industrial technology and training* Extension of technical competence in emerging technologies Materials fee

495 Seminar in Industrial Technology and Training (1-0) Cr 1 *Prereq Senior classification* An exploration of employment opportunities requirements benefits and procedures involved in placement

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

Prior to registration for graduate-level vocational certification courses the student shall be classified as a senior or have an earned bachelor s degree and be required to complete additional assigned readings term papers and graduate projects

502 Applied Techniques in Materials and Processes (2-4) Cr 4 *Prereq 10 credits in industrial education and technology* Classroom simulation of industry and study of the production process Students participate in a profit making corporate structure involving manufacture of hard goods Exploration of management systems controls financing and personnel Materials fee

528 Human and Public Relations for Industrial and Technical Education (2-0) Cr 2 *Prereq IVTE 514* Identifying a plan of public relations for industrial and technical education analysis of publics that need to be reached effect of human relations on public relations criteria for evaluating public relations

532 Industrial Technology for Children (2 2) Cr 3 *Prereq 10 credits in elementary education or industrial education and technology* Development of elementary school programs in industrial technology education Identification of psychomotor and developmental factors in children related to tool and material manipulation Integration of technology concepts into the elementary school curriculum Use of industrial technology education concepts to facilitate concept mastery in other disciplines Materials fee

550 Industrial and School Laboratory Safety (3-0) Cr 3 *Prereq Graduate classification* Safety as it pertains to the industrial technology education and industrial vocational technical teachers OSHA and IOSHA regulations and the standards as required by OSHA and IOSHA

554 History and Philosophy of Industrial Education and Technology (3 0) Cr 3 *Prereq Permission of instructor* An evaluation of educational and industrial thought Historical and philosophical development of industrial technology education to the present trends and implications

555 Administration and Supervision of Industrial Technology Education (3-0) Cr 3 *Prereq 417* Administration supervision curriculum development selection of staff and public relations Evaluating administrative and supervisory efforts program modification Field trips to schools and industries

557 Organization and Management of the Industrial Technology Education Laboratory (3 0) Cr 3 *Prereq 410* Principles and practices involved in the planning organization and management of the school laboratory responsibilities of the school administrator and teacher basic principles of planning selection and purchase of machine tools equipment and materials maintenance storage and control of machines tools and equipment managing the laboratory for effective work

561 Advanced Topics in Energy and Power (2-4) Cr 4 *Prereq 442* Development of integrated systems utilizing fluids electrical and mechanical components Experimentation in alternative energy systems system evaluation for efficiency and cost effectiveness Utilization of computers in real time system monitoring and control of energy and power systems Materials fee

580 Advanced Topics in Graphic Communications (2-4) Cr 4 *Prereq Graduate classification* Exploration of computer graphics Advanced design and drawing applications Integration of aesthetic function cost and human factors specifications in product design evaluation of product design Opportunity for individual creativity and specialization in an area of graphics Materials fee

582 Microcomputers in Industrial Education and Technology (1-4) Cr 3 *Prereq 15 credits in industrial education and technology* The use of low cost microcomputers in the teaching of secondary industrial technology education courses Materials fee

590 Special Topics in Industrial Education and Technology Cr 1 to 4 *Prereq Graduate classification in industrial education and technology*
A Administration
B Professional Methods
C Curriculum
D Drafting Design Planning
E Electricity Electronics
F Instructional Methods
G Technical Training
H History
M Metals Technology
P Power Technology
R Plastics Technology
T Safety
W Wood Technology

593 Workshop in Industrial Education and Technology Cr 1 to 3 *Prereq 15 credits in industrial education and technology Materials fee*

599 Creative Component Cr 1 to 3 A discipline related problem to be identified and completed under the direction of the program adviser Three credits required for all nonthesis master s degree students

Courses for Graduate Students, major or minor

615 Seminar Cr 1 each time taken Must be taken 4 consecutive semesters

652 Program and Student Evaluation (ResEv 652) (2-0) Cr 2 *Prereq Graduate classification* Techniques for evaluating students facilities programs and staff utilizing theories for developing measurement instruments

653 Research and Development (3-0) Cr 3 *Prereq Completion of master s degree and introductory statistics* Examination of industrial R & D practices and procedures product development standards advanced product testing and research designs

657 Curriculum Development in Industrial Education and Technology (3-0) Cr 3 *Prereq 15 credits in industrial education and technology* Basic concepts trends practices and factors influencing curriculum development techniques organization and procedures the course of study and its development in a given curriculum pattern

699 Research Cr arr

Industrial Vocational-Technical Education (IVTE)

Courses Primarily for Undergraduate Students

300 Occupational Competency Cr up to 30 semester hours *Prereq Approval of department head enrolled in B S degree (IVTE) and have planned program leading to endorsement 71 have met the industrial experience requirement for vocational approval have junior classification have completed 10 semester credits at ISU prior to receiving credit for occupational competency* Competency in the following occupational clusters is determined through completion of oral written and performance examinations See Industrial Education and Technology Department Competency Test Program guidelines for additional information
A Automotive and Power Mechanics
B Building Trades
C Commercial Art
D Drafting and Graphics
E Electricity Electronics
F Metal Trades

380 Orientation to Teaching Industrial Vocational Technical Education Programs (2-0) Cr 2 Orientation to industrial vocational teacher education with basic skills necessary for the beginning teacher and experiences in teaching IVTE subjects evaluation and laboratory management career and instructional materials development

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

510 Methods in Technological Education and Training (2-0) Cr 2 *Prereq Permission of instructor* Teaching and training processes methods of presentation and testing lesson planning and organizational instruction

514 Foundations of Vocational and Technical Education (2 0) Cr 2 *Prereq Psych 333* Development and philosophy of vocational technical education federal and state legislation State plans divisions and types of programs

519 Curriculum Development in Technological Education and Training (2-0) Cr 2 *Prereq 510* Course of study development based on occupational analysis Compilation arrangement and limitations of instructional materials

522 Evaluation in Technological Education and Training (2-0) Cr 2 *Prereq 510* Theory and application of evaluation methods unique to technological education and training programs

524 Conference-Leading Techniques (2-0) Cr 2 *Prereq 510* Conference procedures and techniques as applied to teaching and advisory committee functions

525 Coordination of Cooperative Education (2 0) Cr 2 *Prereq 510* Principles of organization coordination and administration of cooperative education with business and industry to provide part time on the-job training for students

530 Administration and Leadership in Industrial Vocational Technical Education (3 0) Cr 3 *Prereq 514* Administration and leadership styles theory of administration and applications to vocational technical education

549 Internship in Industrial Vocational Technical Education (arr) Cr 1 to 4 *Prereq 10 hours in industrial education and technology* Emphasis on full experience in industrial vocational education as it relates to administration supervision special needs curriculum instruction and evaluation research

590 Special Topics in Industrial Education Cr 1 to 5 *Prereq Graduate classification in industrial education and technology*
A Adult/IVTE
B Vocational-Technical
C Curriculum/IVTE
D Evaluation/IVTE
E Special Needs/IVTE
F Instructional Materials/IVTE

G Laboratory Problems/IVTE
I Technical Training/IVTE
J Administration

Occupational Safety (O Saf)

Courses Primarily for Undergraduate Students

201 Principles of Accident Prevention (3-0) Cr 3 F S Basic foundations of accident causation and prevention in home motor vehicle public and work environments

202 Introduction to Occupational Safety (3-0) Cr 3 F *Prereq 201* Introduction to industrial accident prevention as it relates to health and safety and an investigation of accident causation

311 Construction Safety (Con E 311) (2 0) Cr 2 S Survey of the Federal and Iowa Occupational Safety and Health Act Regulation and control of working environment of all employees with emphasis on the construction industry and on the current Federal Register 1926

315 Handling of Products and Hazardous Materials (3-0) Cr 3 F S *Prereq 201 Chem 163 163L junior classification* The manual and mechanical handling procedures of products and materials and the storage of hazardous chemicals

330 Legal Aspects of Occupational Safety and Health (3-0) Cr 3 S *Prereq 202* Legal implications of legislation as it applies to health and safety in the workplace

360 Fire Protection and Prevention (3-0) Cr 3 F *Prereq 202* Causes and prevention of accidental industrial fires

470 Industrial Hygiene Chemical and Biological Hazards (3-0) Cr 3 F *Prereq 315 330 Chem 163 163L 231 232A* A consideration of health related problems found in the industrial setting with emphasis on toxic chemicals ventilation and noise Materials fee

471 Industrial Hygiene Physical Hazards (1 4) Cr 3 S *Prereq 315 330 Chem 163 163L 231 232A* The use and calibration of instruments designed to measure the quality and quantity of contaminants in the work environment

481 Safety Internship Cr 1 to 4 F S SS *Prereq 18 credits in occupational safety* The practical learning experience as a continuation of a student s formal education in occupational safety

490 Independent Study Cr 1 to 4 F S *Prereq 21 credits in occupational safety senior classification*
A Administration
B Legislation
C Curriculum
D Data Analysis Research
E Occupational Safety
F Technical Writing
G Traffic

Industrial Engineering

(Administered by the Department of Industrial and Manufacturing Systems Engineering)

Way Kuo Chair of Department

Professors Barta Berger David Even Kuo Montag Vardeman

Emeritus Professors Cowles Griffen Hempstead Hillyard Kleinschmidt McRoberts Mohr Moore C Smith G Smith Squires Tamashunas Vaughn Walkup

Associate Professors Adams Hendricks Meeks Patterson

Emeritus Associate Professor Love

Assistant Professors Gemmill Jackman Linn McBeth Min

Undergraduate Study

For undergraduate curriculum in industrial engineering leading to the degree bachelor of science see *College of Engineering Curricula*

The industrial engineering curriculum prepares persons who have strong aptitudes in engineering controlling and designing complex industrial systems for the efficient production of goods and services Professional services performed by industrial engineers include line management facilities planning cost and economic analysis, safety engineering ergonomics and human factors quality control and reliability inventory and production control, facilities and methods design work measurement, and operations research

The curriculum includes a thorough foundation in the physical mathematical and engineering sciences analysis synthesis and design Courses in social and humanistic subjects provide students with breadth This foundation prepares the graduate for positions in industry government or graduate work in any of the specializations described in the section on graduate study

A five-year cooperative program is available in the Industrial Engineering curriculum See *Cooperative Programs College of Engineering*

Graduate Study

The department offers work leading to the degrees of master of engineering master of science and doctor of philosophy with a major in industrial engineering A formal minor is available to doctor of philosophy students having a major in another department Graduate study is designed to improve the student s capability in the professional practice of industrial engineering and to develop research ability

The prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this institution

With the help of a program of study committee a graduate student develops an educational program in areas within industrial engineering Typical areas of concentration include engineering economy systems analysis and control manufacturing systems analysis production systems analysis and design life analysis and depreciation operations research and optimization and the human machine interface A major in operations research leading to a master of science degree is co-offered with the Department of Statistics

The department participates in the inter-departmental minors in mineral resources and technology and social change (See *Index*)

Open to graduate students for minor credit only 304 312 313 341 361 374 375 419 436 441 443 444 445 465 475 476

Courses Primarily for Undergraduate Students

101 Orientation (1-0) Cr R S Lectures and conferences designed to aid the freshman student to adjust both in course and in college environments

***205 Engineering Economy** (3-0) Cr 3 F S *Prereq Math 166* Application of fundamentals of economics to engineering alternatives in planning developing and managing industrial projects

277 Applied Ergonomics (2 2) Cr 3 F S *Prereq Stat 231 Phys 221* Introduction to and practical experience with ergonomic concepts and principles of workplace and task design and development In depth investigations into human physiology biomechanics workplace design and environmental stressors as they relate to person machine systems

298 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative education students Students must register for these courses prior to commencing each work period

***304 Analysis for Engineering Economy** (2-0) Cr 2 F S *Prereq Junior classification Com S 205 or Engr 160 Math 166* Engineering/managerial analysis of the economic aspects of public and private project proposals Decisions involving the expenditure of capital funds Alternative sources of funds time value of money methods of evaluating alternative projects

312 Optimization (3-0) Cr 3 F S *Prereq Math 267* Concepts analysis techniques optimization techniques and applications of operations research Construction and optimization of mathematical models for systems using linear programming and goal programming plus post optimality for evaluation results

313 Stochastic Analysis (3-0) Cr 3 F S *Prereq Math 267 Stat 231* Development of basic queuing models and related applications Use of simulation for some applications Project involving data collection analysis of a queuing system is required

341 Material and Project Control (3 0) Cr 3 F S *Prereq 312 Stat 231* Forecasting analysis of inventory systems and sequencing and scheduling problems in the control of material flow with applications in industrial systems Material requirement planning and project control techniques such as PERT and PERT/COST systems are included Construction of mathematical models use of heuristic techniques and use of problem-oriented languages such as FORTRAN in solving problems Project involving design of material control systems required

361 Quality Control (Stat 361) (3 0) Cr 3 F S *Prereq Stat 401 or 231 Techniques for controlling* the quality of products and services Techniques for improving quality through process control Project involving design of quality system

373 Operations Analysis (2-3) Cr 3 F S *Prereq 277 Stat 231* Principles of motion economy and work simplification in operations design Worker machine relationships Manual and computerized measurement tools for operation inputs and outputs Formula construction for time determination of variable elements

374 Industrial Methodology (2 3) Cr 3 F S *Prereq M S E 271* Analysis of industrial processes including fabrication forming cutting welding assembly inspection and finishing Use of computer to enhance the manufacturing process Computer numerical control robot types programming procedures economic considerations financial justifications Materials fee

375 Introductory Production Systems (3-0) Cr 3 F S *Prereq Junior classification Math 160 or 166* Principles and concepts in the design and control of production systems including demand forecasting fixed and variable capacity planning master production scheduling inventory control types of production and work flow systems quality control and work methods and measurement

397 Engineering Internship Cr R F S *Prereq Permission of department* One semester maximum per academic year professional work period

419 Manufacturing Systems Modeling (3-0) Cr 3 F *Prereq 313* Modeling material handling systems inventory systems and production systems for performance analysis Introduction to analysis simulation and physical models of manufacturing systems Simulation languages including GPSS SIMAN and SLAM Network approaches such as MANUPLAN

436 Introduction to Reliability Engineering (3-0) Cr 3 S *Prereq Senior classification Stat 231 or 401* Mathematical basics for dealing with reliability data theory and analysis of load and strength and systems reliability prediction methods to assure reliably designed systems Reliability demonstrations and reliability growth monitoring Fault tree and event tree analysis

439 Manufacturing Systems Control (2 3) Cr 3 F S *Prereq E E 441* Programming and interfacing microcomputers for communications and control Algorithms control circuits and software for machine control and shop floor control

441 Industrial Engineering Design (1-6) Cr 3 F S *Prereq 305 312 313 373 374* A large open-ended design project related to industrial systems Application of engineering design principles including problem definition analysis synthesis and evaluation

443 Industrial Materials Handling (3 0) Cr 3 S *Prereq 312 313* Analysis and application of mobile fixed path and semi fixed path material handling systems and planning for the related facilities Manufacturing warehousing and distribution systems with respect to materials handling

444 Computer Integrated Manufacturing I CAM (2 3) Cr 3 F *Prereq 374* Technologies involved in computer aided manufacturing CNCs robotics programmable logic controllers flexible manufacturing computer aided process planning and computer networking

445 Computer Integrated Manufacturing II CAD (2 3) Cr 3 S *Prereq Math 266 or 267 Engr 262 263* Three dimensional transformations homogeneous representations 3-D projections wireframe models basic parametric representations of curves surfaces and solids Utilization of solid modeling software

465 Knowledge Engineering (2 3) Cr 3 F *Prereq Stat 231* Introduction to knowledge based systems The production system model rules and expert system architecture Use of a symbolic programming language Emphasis on artificial intelligence applications in industrial and manufacturing planning and scheduling

475 Work Systems Design (3-0) Cr 3 F S *Prereq 277 Psych 101* Design jobs and work systems for improved productivity and quality Technical systems analysis social systems analysis analytical models and organization factors used to enhance system productivity

476 Design for Humans in Industrial Systems (2 2) Cr 3 F *Prereq 277* Physical psychological and environmental factors affecting human performance in the workplace Emphasis on the solving of and designing to eliminate or reduce industrial ergonomic problems

490 Independent Study Cr 1 to 5 each time elected *Prereq Senior classification permission of instructor* Independent study and work in the areas of industrial engineering design practice or research
- H Honors
- J Applied Operations Research
- K Manufacturing
- M Human Machine Interface

*Credit for either 205 or 304 may be applied toward graduation but not both

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

(An undergraduate student must have an academic standing in the upper one-half of his/her class to enroll in any 500-level industrial engineering course)

501 Dynamics and Economics of Production (3 0) Cr 3 F *Prereq 312 or Math 307* Quantitative theory of production from systems design and analysis perspective Production systems problems inventory control and scheduling economic environment of production systems Optimal production planning processes production function estimation and production control Economic implications for static and dynamic production systems

502 Capital Expenditure Programming (3-0) Cr 3 F *Prereq 205 or 304* Computerized economic decision package Critique of rate of return and present worth figures of merit Recognition of mixed investments Multiple root solving algorithm Ranking inconsistency problem Mortgage equity analysis

503 Advanced Engineering Economy (3 0) Cr 3 S *Prereq 502* Factors affecting the policy queue and the optimum rationed level of expenditure Multi valued estimates in the context of risk uncertainty and incomplete knowledge Incomplete knowledge under Bayes LaPlace and weak ranking

508 Design and Analysis of Allocation Mechanisms (3-0) Cr 3 S *Prereq 312 or Math 307* Market based allocation mechanisms from quantitative economic systems perspective Pricing and costing models designed and analyzed with respect to decentralized decision processes information requirements and coordination Case studies and examples from industries such as regulated utilities and semiconductor manufacturers

510 Network Analysis (3-0) Cr 3 Alt F offered 1993 *Prereq 312 313* Deterministic network flows generalized analysis of capacitated deterministic networks stochastic networks and network optimization Methods and applications of network analysis to various engineering and optimization problems

512 Queuing Theory and Applications (3-0) Cr 3 S *Prereq 313* Development and use of mathe matical models for the analysis of queuing systems Applications to industrial and manufacturing systems as well as service industries Steady state as well as transient systems are included

514 Scheduling and Inventory Theory (Stat 514) (3 0) Cr 3 S *Prereq 312 341 Stat 231 or 432* Deterministic scheduling theory for machine shop systems Complexity results for various systems such as job flow and open shops Applications of linear programming integer programming network analysis Enumerative methods for machine sequencing

517 Design of Industrial Engineering Systems (3-0) Cr 3 Alt S offered 1995 *Prereq 205 312 313* Application of feedback and dynamic concepts to industrial systems Quantitative and simulation methods used to analyze and design effective systems for inventory quality scheduling etc making efficient use of all resources including secondary materials

519 Simulation Modeling and Analysis (3-0) Cr 3 S *Prereq Com S 311 Stat 401* Event scheduling process interaction and continuous modeling techniques Probability and statistics related to simulation parameters including run length inference design of experiments variance reduction and stopping rules Aspects of simulation language

520 Knowledge Based Manufacturing Systems (2-3) Cr 3 S *Prereq 419 or 465 or Com S 472* Knowledge based systems as applied to automated manufacturing production planning and scheduling group technology robotics facilities design and process control Knowledge representation search and predicate calculus

531 Statistics for Quality and Productivity (Stat 531) See *Statistics*

533 Reliability (Stat 533) See *Statistics*

534 Linear and Goal Programming (3-0) Cr 3 F *Prereq 312* Theory and computational aspects of simplex and primal-dual algorithms Duality and post optimality tools in theory and applications Coal programming including duality and post optimality

539 Game Theory (Econ 539 Stat 539) See *Statistics*

540 Operations Research Methods and Economic Analysis (Econ 540 Stat 540) See *Statistics*

541 Material Control Applications (3-0) Cr 3 F *Prereq 341* Deterministic and stochastic lot sizing models for material control Analysis of material requirements planning systems master scheduling and capacity planning

542 Computer Aided Manufacturing I (3 0) Cr 3 F *Prereq 374* Applications of computer technologies in planning and controlling manufacturing processes Computer numerical controls CNC programming languages flexible automation communication protocols process planning CAD/CAM integration and software aspects of computer integrated manufacturing

544 Geometric Modeling in CAD/CAM (3-0) Cr 3 S *Prereq Math 267 knowledge of C language* Representation and manipulation of curves surfaces and solids for applications in the context of intelligent manufacturing systems such as process planning assembly planning tolerance analysis and allocation inspection in quality control group technology and manufacturing cost minimization

565 Systems Engineering and Analysis (Aer E 565 EE 565) (3 0) Cr 3 F *Prereq Graduate classification in engineering* Introduction to organized multidisciplinary approach to designing and developing systems Concepts principles and practice of systems engineering as applied to large integrated avionics systems Life-cycle costing scheduling risk management functional analysis conceptual and detail design test and evaluation and production Not available for degrees in industrial engineering

577 Human Factors (2 2) Cr 3 Alt F offered 1994 *Prereq 277 Stat 231 or 401* Physical and psychological factors affecting human performance on systems Signal detection theory human reliability modeling information theory and performance shaping applied to safety reliability productivity stress reduction training Laboratory assignments related to system design and operation

590 Special Topics Cr 1 to 5 each time elected Independent study and work to explore recent advances and innovative approaches to industrial engineering design practice and research
- J Applied Operations Research
- K Manufacturing
- M Human Machine Interface

599 Creative Component Cr var
- A Major in Industrial Engineering
- C Major in Operations Research

Courses for Graduate Students, major or minor

631 Nonlinear Programming (3-0) Cr 3 Alt S offered 1994 *Prereq 534 or Stat 540* Constrained and unconstrained nonlinear optimization techniques including search techniques dynamic programming Lagrange multipliers generalized reduced gradient method sequential unconstrained minimization technique heuristic methods and network optimization

632 Integer Programming (3 0) Cr 3 Alt S offered 1995 *Prereq 534 or Stat 540* Integer programming including cutting planes branch and bound and search enumeration Goal programming and specialized algorithms

636 Software Reliability and Management (3 0) Cr 3 Alt F offered 1994 *Prereq 312 Com S 411* Software reliability methodologies and modeling

techniques for the development of quality cost effective and schedule meet software Software quality and reliability as attributes of total system performance

642 Simultaneous Engineering in Manufacturing Systems (3-0) Cr 3 Alt F offered 1993 *Prereq 441 or M E 415* Current engineering methods for the product life cycle process Feature-based design computer aided process planning and data driven product engineering

645 Computer Aided Manufacturing II (3-0) Cr 3 S *Prereq 542 544* Advanced research projects in computer aided manufacturing Geometric tolerancing CNC hardware and software issues process planning and control integrated manufacturing systems

690 Advanced Topics Cr var

699 Research Cr var

A Industrial Engineering
C Operations Research

Industrial Relations

(Interdepartmental Graduate Program)

Supervisory Committee Paula C Morrow Chair J P Mattila Y S Lee J C McElroy C L Mulford T A Pickett

Work is offered for the degree master of science with a major in industrial relations This is a multidisciplinary degree offered cooperatively by the departments of Economics Management Political Science Psychology and Sociology

Graduate students in industrial relations usually receive their undergraduate background in economics business administration political science psychology or sociology Admission is not restricted to students from these majors however Students entering industrial relations ideally should have a broad background in the social sciences

The program in industrial relations is regarded as education for both professional practice and scientific inquiry Through the Industrial Relations Center and its interdisciplinary faculty facilities and opportunity exist for research of both a fundamental and applied nature on a variety of problems concerned with the world of people at work

A student majoring in industrial relations will choose a major professor from the graduate faculty of the cooperating departments The student s program of study will be developed with the guidance of an advisory committee selected by the student and the major professor approved by the chair of the Industrial Relations Supervisory Committee and appointed by the dean of the Graduate College Students may elect the thesis option (consisting of 30 semester-hour credits) or the nonthesis option (consisting of 36 semester-hour credits)

Regardless of which option is taken all students must take the following core courses Econ 445 Mgmt 570 Mgmt 571 and Stat 401 For students enrolled in the nonthesis option the research component of their degree program will be satisfied via the completion of a 3-credit creative component For students enrolled in the thesis option the research component of their degree program will be satisfied via the completion of a 6-credit thesis The balance of the program of study for students in either option will consist of electives from the recommended courses in the industrial relations curriculum with a maximum of four courses in any one department A minimum of 12 semester credits must be taken from 500-level (or above) courses In general the degree program in industrial relations is designed to be as flexible as possible to support the student s own professional interest Satisfactory completion of a final comprehensive oral examination is required of all students As part of their graduate education students enrolled in the nonthesis program have the option of enrolling in an off-campus internship program

Courses appropriate for the master of science degree are determined by the student s program of study committee Sample recommended courses for graduate students majoring in industrial relations include Econ 404 445 446 590B 596 Mgmt 510 520, 530 570 571 575 590 Pol S 571 572 573 575 576 590 Psych 440 450 451 550 551 590 623 Soc 420 511 530 532 590B 642 Stat 401 402 See departmental listings for course descriptions and credits

Courses for Graduate Students

598 Internship Cr 1 to 6 *Prereq Graduate enrollment in industrial relations* Internship designed for work exposure in a personnel or labor relations department of a private or public employer Not recommended for students already having had such work experience

599 Creative Component

699 Research

International Agriculture

(Interdepartmental Undergraduate Program)

Program Coordinator Harold R Crawford

Advisers Don R King Gary A White

The international agriculture program is designed for students with an interest in better understanding global factors that interact to impact agricultural production distribution processing and utilization worldwide As participants in this program, students will be better prepared to seek overseas employment with embassies consulates nonprofit assistance agencies and other international programs They may also prepare for jobs in the United States with such agencies as the Foreign Agricultural Service of the U S Department of Agriculture the Agency for International Development and multinational businesses related to agricultural sciences food processing and commerce

Secondary Major

International agriculture is an undergraduate secondary major that may be taken only in conjunction with a primary major in an agriculture curriculum Students choosing international agriculture will strengthen their career placement with a business or agency involved in international activities Technical knowledge of a primary major discipline will be strengthened by a global awareness of agriculture A secondary major in international agriculture will give students practical insight into the role of agriculture in a world of increasing food and fiber needs It is ideal for young people who wish to broaden their international perspective or prepare for international work in agriculture agricultural trade companies agricultural scientific research or related service institutions

The secondary major curriculum includes emphasis in the social sciences international agriculture and foreign languages See *International Agriculture Curriculum* for the specific program Students interested in earning a secondary major in international agriculture must contact a program adviser The early indication of an interest in international agriculture allows for effective integration of the secondary major course requirements with those of the primary major

Minor

A minor in international agriculture is available to interested students regardless of their major Students selecting the minor should have at least minimal familiarity with agriculture and agricultural systems and are expected to have completed nine credits from the following list of courses before declaring the minor Agron 114 154 206 An S 114 Soc 130 Hort 221

The minor in international agriculture may be earned by completion of at least 15 credits in related courses taken at Iowa State with a grade of C or higher The following courses must be taken for a minor Soc 411 Econ 306 or 411 Pol S 422 and one course selected from Agron 406 415 483 or T SC 341 or 442 The remainder of the credits may be selected from the following Agron 241 JI MC 476 Pol S 241 a foreign language or any of the above listed courses not selected Courses meeting requirements in a student s major may not be applied toward a minor in international agriculture Contact the program advisers for further information

For more information about courses required for either a secondary major or a minor in international agriculture see descriptions in the designated departments

International Studies

(Interdepartmental Undergraduate Major and Minor)

Supervisory Committee Steffen W Schmidt Chair S Agarwal T Austin J Courteau W Grundmann D King S Williams W Wolansky two student members

The international studies program provides opportunities for students to develop skills and understanding relevant to international concerns It allows students an opportunity to focus on a particular geographical area of the world Students must follow college-specific rules in the selection of courses and must consult with the representative of that college to the University International Studies Committee when selecting courses The college representatives to the advisory committee will be responsible for advising students in their respective colleges and will inform students about the details of the college-specific rules

International studies students are strongly encouraged to participate in one of ISU s study abroad programs Planning should occur early in a student s academic career Options include participating in one of ISU s semester abroad programs, enrolling in a foreign university with which ISU has an exchange agreement or participation in programs offered through other institutions The Study Abroad Center in the English Office Building has information on specific offerings as well as materials on financial assistance

A secondary major and a minor in international studies are available for undergraduates The program requirements are outlined below The international studies program is designed for students who wish to become prepared for work in the international arena such as in foreign service journalism advocacy organizations overseas business development projects or for careers with international organizations (e g agencies of the United Nations)

Secondary Major

The international studies major may be taken only as a secondary major program

A student seeking a secondary major in international studies must successfully complete a minimum of 24 credits including University Studies 235 and 430 in courses approved for use in the international studies program The member of the University International Studies Committee in the college of the student s primary major can provide a list of approved courses

In addition to the 24 credits in approved courses a student seeking a secondary major must demonstrate the equivalence of two years of university-level study in one language in addition to English A student whose language is other than English must pass Engl 105 with a grade of C or better

It is highly recommended that international studies majors participate in one of ISU s study abroad programs Those who do so may petition to use up to nine credits of work to meet the 24-credit requirement in international studies courses

Minor

A student seeking a minor in international studies must successfully complete a minimum of 15 credits including University Studies 235 and 430 in courses approved for use in the international studies program Interested students should see a representative of the University International Studies Committee in the college of their primary major for the list of approved courses

In addition to the 15 credits in approved courses a student seeking a minor must demonstrate the equivalence of one year of university-level study in one language in addition to English A student whose language is other than English must pass Engl 105 with a grade of C or better

Students who minor in international studies and who study abroad may petition to use up to four credits of work to meet the 15 credit requirement in international studies courses

Students with interest in the minor should consult with the representative of the University International Studies Committee from the college of the student s primary major

International Studies (IntSt)

Procedures for obtaining credit for international study programs vary by program In some such as exchange programs students enroll in the foreign institution and transfer credit back to Iowa State In international study programs designed for specific majors students enroll in specified Iowa State courses within the appropriate departments In others such as the London Program, students may obtain Iowa State University credit through enrollment in the international study courses listed below Information about international study opportunities requirements and procedures for obtaining university credit may be obtained from academic advisers, college representatives to the University International Studies Committee or the Study Abroad Office located in the E O Building

The Iowa Regents institutions provide a number of regularly scheduled international programs and study opportunities These programs are sponsored by Iowa State University, the University of Iowa and the University of Northern Iowa and take place during the regular academic year or the summer session They involve Iowa State University faculty and students and are held in several locations Students register for ISU credit before leaving the campus

Courses Primarily for Undergraduate Students

110 210 310 410 London Program (U St 110 210 310 410) Cr var *Prereq Permission of chair of London Program* Classes offered by a consortium of British and American faculty courses on topics such as English literature history art architecture as well as social science and international business

120 220, 320 420 International Studies (U St 120 220 320 420) Cr var *Prereq Permission of the chair of the International Studies Committee*

235 Introduction to International Studies (U St 235) (3 0) Cr 3 F Overview of international studies emphasizing cultural economic and political characteristics of major groups of nations and their interactions

430 Seminar in International Studies (U St 430) (3 0) Cr 3 S Capstone seminar in international studies focused on cultural economic political social and other issues in a global perspective

Journalism and Mass Communication

J Thomas Emmerson Chair of Department

Professors Abbott, Beell Emmerson Gillette Smith

Emeritus Professors Blinn Boyd Disney Friederich Hvistendahl Kunerth Schwartz Shelley Wechsler

Associate Professors Coon Eich Fowler Fritz Haws Mack Niebauer Peterson Prior-Miller

Assistant Professors Caristi Geske, McConnell Rega

Undergraduate Study

The department offers work for the bachelor of arts degree in advertising and for the bachelor of arts or science degree in journalism and mass communication For JI MC majors the type of degree is determined by the designated area of concentration selected by the student The type of degree for a student with a cross-disciplinary designated area of concentration will be determined in consultation with the student s academic adviser

The department was established in 1905 and has been continuously accredited since 1948 by the Accrediting Council on Education in Journalism and Mass Communications Fewer than 95 of the nation s 400 journalism and mass communication programs are accredited To be accredited programs must pass a rigorous assessment from a site team of outside experts who evaluate the program The department was reaccredited in 1992

In 1990 the department s broadcast journalism program merged with the university s telecommunicative arts major to form a new emphasis within the department — electronic media studies

To become a JI MC or advertising major all students including transfer students must successfully complete JI MC 101 110, and 201 Before registering for JI MC 201 the student must complete Engl 105 and pass the departmentally administered spelling grammar and usage test

English Proficiency Requirement
To graduate as a JI MC or an advertising major the student must pass the departmentally administered English Usage Test and earn a grade of at least a C+ in Engl 104 105 (or 105H) JI MC 201 and 202 or 203 or 206

The Journalism and Mass Communication Major

The major in journalism and mass communication allows the student to pursue a general program of study or to select one of six emphases electronic media studies magazine newspaper public relations/public information science communication or visual communication

The student who majors in journalism and mass communication must earn at least 124 5 credits with a minimum of 32 credits in appropriate department courses and at least 90 credits in courses outside the department with a minimum of 65 of those credits earned in basic liberal arts and sciences For courses that meet the liberal arts and sciences requirement, see department literature or your adviser

The Core for the Journalism and Mass Communication Major

Cr	Degree Requirements
3	Mass Media and Society—JI MC 101
R	Orientation to Journalism and Mass Communication—JI MC 110
3	Reporting and Writing for the Mass Media—JI MC 201

3	Intermediate Reporting and Writing for the Mass Media—JI MC 202 or Reporting and Writing for the Electronic Media—JI MC 206
3	Law of Mass Communication—JI MC 460
3	Professional Media Internship—JI MC 499
10 to12	300-level courses, at least one of which must be JI MC 306 309/310 321 340 342/343, 344 346 347 or 349
1	JI MC 491 492 493 494 495 or 496
6	Additional 400-level courses at least one of which must be JI MC 400 401 453' 454 461 462 464 474 or 476
32-34	

The Advertising Major

The major in advertising allows the student to select either the creative or the executive track

The student who majors in advertising must earn at least 124 5 credits with a minimum of 34 credits in appropriate department courses and at least 90 credits in courses outside the department with a minimum of 55 of those credits earned in liberal arts and sciences courses For courses that meet the liberal arts and sciences requirement see department literature or your academic adviser

The Core for the Advertising Major

Cr	Degree Requirements
3	Mass Media and Society JI MC 101
R	Orientation of Journalism and Mass Communication JI MC 110
3	Reporting and Writing for the Mass Media JI MC 201
3	Advertising Copywriting JI MC 203
3	Advertising Principles JI MC 330
3	Advertising Communication JI MC 334 Depending on track either
3	Advertising Media Concepts JI MC 335 or
3	Visual Principles and Lab JI MC 342 343A
3	Advertising Campaigns JI MC 434
3	Law of Mass Communication JL MC 460
1	Professional Seminar—Advertising JL MC 493
3	Professional Media Internship JI MC 499
28	Total

Three additional credits are to be chosen from among JI MC 309/310/311 314 315 321 335 342/343A or 435 and three additional credits are to be chosen from among JI MC 400 401 461 462 464 474 476

Designated Area of Concentration, Enhancement Courses

To succeed as a media professional, the student needs a broad-based academic background which the department seeks to ensure by requiring students to take courses outside the department in both a designated area of concentration and specific enhancement courses

The designated area of concentration is made up of a minimum of 24 credits with at least 15 credits from the 300 level or above It is a student-designed adviser-approved grouping of courses outside the department that will meet the student s professional or academic interests For instance the student planning a career in agricultural journalism or family and consumer science journalism could create a DAC from an appropriate group of courses from either of those colleges Advertising majors who complete the creative or executive track of study meet the DAC requirement A second major outside the department may count as the DAC

Enhancement courses are those courses most of which are from outside the department that the faculty has decided must be taken by the student to ensure a sufficiently broad education Many of the enhancement courses can also be used to fulfill the group requirements of the College of Liberal Arts and Sciences The list of enhancement courses is available from the department office or your adviser

All department majors are required to earn 52 credits at the 300 and 400 level

Minors

Journalism and Mass Communication JL MC minors are designed within the department emphases For specific requirements of each emphasis see department literature or your adviser

To become a JI MC minor the student must first pass the departmentally administered English Usage Test and earn a grade of at least a C+ in JI MC 201

JI MC minors are required to complete at least 18 credits in department courses including 201 and 202 or 206 6 credits from among 300-level courses and 3 credits from among 400-level courses

Advertising To become an advertising minor the student must first pass the departmentally administered English Usage Test and earn a grade of at least a C+ in JI MC 201

Advertising minors are required to complete at least 18 credits in department courses including 201 203 330 334 335 or 342/343A and 434

The department participates in the interdepartmental programs in international studies and technology and social change (See *Index*)

Graduate Study

The department offers work for the degree master of science with a major in journalism and mass communication Minor work is available to students taking major work in other departments

The emphasis of the program is on the study of scientific and technological communication from both theoretical and professional skills perspectives

Majors plan programs of study in one of three concentrations

I Science Writing—developing effective reporting and writing skills to disseminate information about science technology and agriculture to a range of publics through a variety of channels Appropriate for media professionals and those with a science background

II Mass Communication in Science and Technology—the study of the theory preparation and use of media materials to transmit scientific technological and agricultural knowledge to the public Appropriate for those interested in public information or international development communication

III Mass Communication as a Social Science—the study of the role and impact of mass communication on individuals and society primarily from a social science perspective Appropriate for those interested in studying the mass media from a variety of perspectives

Students in all three concentrations have the option of writing a thesis or completing a creative component

Core courses for students in the three concentrations are JI MC 501 502 510 601 and 650 Elective coursework is selected with approval of the student s Program of Study Committee

Students with bachelor s degrees in a variety of academic disciplines and with diverse professional experience may be accepted into the program However students without a degree or experience in journalism or mass communication may be required to take additional coursework

The Graduate Record Examination (GRE) general test scores must be submitted for admission
Admission of international students is limited to those (1) who are engaged in communication or development in such fields as agriculture family and consumer science or natural resources in their native countries and whose employment indicates a need for specialized communication training or (2) who can document at least two years of professional experience in a mass communication field or teaching mass communication who wish to improve their professional skills A score of 550 on the TOEFL is required for admission to the program

The department participates in the interdepartmental minor in technology and social change

Open to non-journalism graduate students for minor credit only JI MC 401 460 461 462 464

Journalism and Mass Communication (JI MC)

Courses Primarily for Undergraduate Students

101 Mass Media and Society (3-0) Cr 3 F S SS Communication models and their application to the mass media the mass communication process organization characteristics and responsibilities of the mass media media related professional operations

110 Orientation to Journalism and Mass Communication (1-0) Cr R F S Orientation to the department career opportunities emphasis areas and requirements in the advertising and journalism and mass communication curricula

201 Reporting and Writing for the Mass Media (1 5) Cr 3 F S SS *Prereq Engl 105 some typing proficiency satisfactory performance on the English Usage Test administered by the department before registering for the course* News judgment and news gathering for the mass media Writing and reporting techniques including backgrounding speech coverage interviewing and writing multi source stories

202 Intermediate Reporting and Writing for the Mass Media (2 3) Cr 3 F S *Prereq 201* Covering standard news assignments and beats developing public opinion stories reporting and writing complex stories

203 Advertising Copywriting (2 3) Cr 3 F S *Prereq 201 and credit or enrollment in 330* Advertising copywriting for print media radio and television Basic advertising research and strategy development For advertising majors and minors

205 Publicity Methods (3-0) Cr 3 F S SS *Prereq Engl 105* Communication and publicity fundamentals and the use of media for publicity purposes Publicity campaigns Preparing releases for print and broadcast basics of publication layout Not available to JI MC and advertising majors

206 Reporting and Writing for the Electronic Media (2 3) Cr 3 F S *Prereq 201 concurrent enrollment in 306* Researching organizing and writing for audio video and film media Basic principles of news information and entertainment programming content and structure

303 Moving Image Methods (2 3) Cr 3 S *Prereq 201* Introduction to basic audio and visual principles concepts and skills Designed for non EMS students majoring in journalism and communication who want to develop production skills Not available for EMS students

306 Electronic Media Production (2 3) Cr 3 F S *Prereq 201 credit or enrollment in 206* Creation of short audio and video productions using basic field and studio equipment and procedures Materials fee

308 Structure of the Moving Image (2 3) Cr 3 S *Prereq 306* Basic techniques in single camera video directing shooting editing and writing Materials fee

309 Fundamentals of Photography (2-0) Cr 2 F S SS Lecture emphasizes documentary and photojournalistic photography as tools of communication Technical theory aesthetic and communication principles fundamentals of photographic communication in contemporary media May be taken alone or with one or both laboratories

310 Laboratory in Fundamentals of Photographic Technique (0-4) Cr 2 F S SS *Prereq Credit or enrollment in 309* The photographic process from exposure to printing of silver based black and white materials Camera and lens use basic lighting techniques of photographic presentation Materials fee

311 Photojournalism (0-4) Cr 2 S *Prereq 310* Application of photographic technique to communication requirements The photo essay and the photographic illustration Emphasis on photography for reproduction in various communications media Materials fee

314 Color Photography (3-0) Cr 3 F Color photography on the intermediate level Use of 35 mm color transparency film Emphasis on natural and social environment Introduction to multi image presentation

315 Multi Image Production (3-0) Cr 3 S Production of professional level multi image presentations Intensive hands-on work with slide editing slide sequencing scripting and story boarding Development of mixed sound tracks use of dissolve programming and cueing devices Production of single and multiple screen presentations

***320 (520 DL) Principles of Public Relations** (3-0) Cr 3 F S SS *Prereq 6 credits in social science* Public relations in business and other organizations functions process and management attitudes public opinion and persuasion tools of the public relations and corporate communications practitioner management of change in contemporary society

321 Public Relations/Corporate Communications Techniques (2-3) Cr 3 F S *Prereq 201 320* Application of the techniques of public relations and corporate communications including news releases publications print and broadcast materials

330 Advertising Principles (3 0) Cr 3 F S SS Historical social economic and legal aspects Evaluation of advertising research media strategy and appeals of advertising Creation of broadcast and print advertising studied Not recommended for freshmen

334 Advertising Communication (2 2) Cr 3 F S SS *Prereq 201 203 330 342 and 343A recommended* Development and execution of advertising for print and broadcast media Strategy formation prospect analysis market segmentation positioning creativity art direction and copywriting Legal ethical and managerial considerations

335 Advertising Media Concepts (2 2) Cr 3 F S SS *Prereq 330* Concepts of media planning and selection in the development execution and evaluation of advertising campaigns Characteristics and capabilities of the advertising media Utilization of market segmentation consumer buying and media audience data bases

340 Magazine Reporting and Writing Practicum (2 1) Cr 2 or (2 2) Cr 3 F *Prereq 202* Practical experience on student magazines Instructor critiques of student work

341 Contemporary Magazine Publishing (3-0) Cr 3 F S *Prereq Sophomore classification* Analysis of magazine industry and of specific audiences served Editorial procedures and policies Advertising circulation and history of the industry Individual study of magazines

342 Visual Principles for Mass Communicators (2-0) Cr 2 F S SS *Prereq Sophomore classification* Understanding of the visual message Visual perception design syntax design elements and how they fit in the visual communication of mass media

343 Laboratory in Visual Principles (0 2) Cr 1 F S SS Application of basic design principles Credit for only 343A or 343B may be applied toward graduation

A Advertising *Prereq Credit or enrollment in 203 and 342* Projects include the design of print advertising brochures point-of purchase materials

B Print Media *Prereq Credit or enrollment in 202 and 342* Study of publication packaging redesign and editing of visuals Projects include developing magazine and newspaper designs

344 Depth Reporting and Writing (2-2) Cr 3 F *Prereq 202 or 206* Developing comprehensive news features and magazine articles on current issues Emphasis on writing excellence Majors may not apply both 344 and Engl 303 toward graduation

346 Public Affairs and Investigative Reporting (2-2) Cr 3 S *Prereq 202 or 206* Reporting on government business and other institutions identification of and access to public records investigative reporting techniques developing majo stories on public agencies and issues For print and broadcast media

***347 (547 DL) Science Writing** (2 2) Cr 3 S *Prereq 202 or 206* Reporting and writing newspaper and magazine articles about science medicine and technology

349 Print Media Editing (1 5) Cr 3 F S *Prereq 202* Copy editing and photo-art preparation headline writing layout and design Editorial decision making

353 Information Presentation and Performance (2 2) Cr 3 F *Prereq 306* Adaptations in presentation style that the electronic media require of the narrator announcer news anchor and interviewer/host Materials fee

354 Intermediate Electronic Media Production (2 3) Cr 3 S *Prereq 306* More detailed applications of audio and visual techniques and principles for integrating studio and field video with computer-generated graphics and special effect in laboratory and field projects Materials fee

355 Reporting for the Electronic Media (2 3) Cr 3 F *Prereq 206 306* Radio and television news techniques reporting with electronic newsgathering equipment writing news scripts editing scripts and video tape producing news and public affairs programs Materials fee

390 Workshop Cr 1 SS (S-F only)
- A Newspaper Advising Design and Management
- B Yearbook Advising Design and Management
- C Basic Publications Design and Graphics
- D Advanced Design and Layout of Publications
- E Photography and Photo Lab Management
- F Journalism Teaching Methods and Curriculum Planning
- G High School Publications Adviser Skills
- H Newsletters Brochures and Desktop Publishing
- I Advising Tomorrow s Award Winning Publications
- J Publications Practicum
- Q Teaching Writing to High School Journalists
- R Computer Applications for Scholastic Journalism

***400 (500 DL) Media Management** (3 0) Cr 3 S *Prereq 201 Econ 201 highly recommended* Decision-making functions of media Basic media market analysis media organization and management circulation and audience development technological developments affecting management decisions media relationships with labor and regulatory agencies which affect medi operation

401 Mass Communication Theory (3 0) Cr 3 F S *Prereq 6 credits in social science* Theory and research in mass communication processes and effects the scientific process methods of measuring evaluating and reporting mass communication research

***424 (524 DL) Public Relations Campaigns** (3 0) Cr 3 F S *Prereq 320 321* Development of public relations and corporate communications campaigns for business and social institutions Projects involve budgeting media selection campaign strategy and creative execution

***434 (534 DL) Advertising Campaigns** (3-0) Cr 3 F S *Prereq 334 and 335 or 342/343A* Developmen of advertising campaigns for business and social institutions Projects involve budgeting media selection market analysis campaign strategy and creative execution

435 Advanced Advertising/Public Relations Campaigns Cr 1 to 3 to a maximum of 3 credit , F S *Prereq Permission of instructor* Preparation of materials for regional and national competitions

453 Electronic Media Technology Public Policy and Responsibility (3-0) Cr 3 Alt S offered 1995 *Prereq Junior classification* Issues and policies affecting the historical and contemporary development of electronic media and their technologies

54 Critical Analysis and History of the Moving nage (3-0) Cr 3 Alt S offered 1994 *Prereq unior classification* Evolution of video television Im computers and related technologies and the nplication of such evolution on future evelopment

55 Advanced Electronic Media Production (2 2) r 3 F *Prereq 354 or 355* Production policies rocedures and practices involved in taking an ıformational video project from conception to ompletion Theory and practice

60 Law of Mass Communication (3 0) Cr 3 S SS *Prereq 201 and 6 credits in social science* ibel privacy sedition obscenity contempt opyright postal laws the Federal Communications ct laws affecting advertising legal publication and ther business activities of the press

61 History of American Journalism (3-0) Cr 3 S *Prereq 6 credits in social science or history* ole of the media in shaping the social economic nd political history of America impact of change in ıese areas on the development traditions and hilosophies of the media

62 Media Ethics Freedom, Responsibility (3-0) r 3 F S SS *Prereq 201* Media ethics and erformance functions of the media in relation to ıe executive judicial and legislative branches of overnment agencies of media criticism right to now versus right to privacy

64 Journalism and Literature (3 0) Cr 3 F *'rereq 6 credits in history or American literature* Vriting as art as practiced by Twain Hemingway rane Dreiser Whitman Mencken others inquiry ıto the problems of the New Journalism as racticed by contemporary journalists

474 (574 DL) Impact of Communication echnology on People and Societies (T SC 74/574 DL) 3-0) Cr 3 F *Prereq 6 credits in social cience* Seminar on present and potential effects of ıcreasingly sophisticated modes of mass ommunication on people institutions and ocieties

476 (576 DL) World Communication Systems nd International Development (3 0) Cr 3 F *'rereq 6 credits in social science* World ommunication systems newsgathering and ıssemination agencies factors determining flow nd volume of news Comparative analysis of role of 'aditional and mass media in developed and eveloping countries

90 Independent Study in Communication r arr *Prereq 6 credits in journalism and mass ommunication permission of instructor ompletion of a proposal form No more than 6 redits of 490 may be used toward a degree in ournalism and mass communication or advertising* tudents may study problems associated with a ıedium a professional specialization a hilosophical or practical concern a reportorial ıethod or writing technique or a special topic in ıeir field

- I Media Studies
- \ Book Publishing
- 3 Electronic Media Studies
- C Magazine
-) Newspaper

- I Professional Specialization
- E Advertising
- = Communication Technology
- 3 Education
- 4 Honors
- I Media Management
- K Public Relations
- _ Visual Communication

- I Problems and Methods
- A Contemporary Issues
- J Ethics and Responsibility
-) Special Communication (Agriculture Family and Consumer Sciences Engineering Science)
- > International Communication
-) History and Literature
- 3 Law
- 5 Public Opinion
- T Research Methods
- V Technique and Style
- U Documentary
- V Persuasion and Criticism
- W Public Affairs Reporting

491 Professional Seminar—Visual (2-0) Cr 1 8 weeks Alt S offered 1995 *Prereq Advanced classification*

492 Professional Seminar—Public Relations (2 0) 8 weeks Cr 1 F *Prereq Advanced classification*

493 Professional Seminar—Advertising (2-0) 8 weeks Cr 1 F S *Prereq Advanced classification*

494 Professional Seminar—Newspaper (2 0) 8 weeks Cr 1 F *Prereq Advanced classification*

495 Professional Seminar—Electronic Media Studies (2-0) 8 weeks Cr 1 S *Prereq Advanced classification*

496 Professional Seminar—Magazine (2 0) 8 weeks Cr 1 S *Prereq Advanced classification*

499 Professional Media Internship Cr 3 *Prereq 202 203 or 206 advanced classification and permission of adviser* Required of journalism or advertising majors A job or internship in mass communication specialization 10 weeks full time or equivalent part time grading based on student report and employer evaluation Offered on a satisfactory fail basis only Not available to nonmajors

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*See page 119 for information on dual-listed (DL) courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***500 (400 DL) Media Management** (3-0) Cr 3 S *Prereq 6 credits in social science (economics highly recommended)* Decision making functions of media Basic media market analysis media organization and management circulation and audience development technological developments affecting management decisions media relationships with labor and regulatory agencies that affect media operation

501 Theories of Mass Communication (3-0) Cr 3 F *Prereq 6 credits in social science* Examination of major areas of research activity and theoretic development related to organization functions and effects of mass communication

502 Communication Research Methods (3 3) Cr 4 S *Prereq 501* Survey research audience and readership studies readability content analysis and experimental research

504 Advanced Journalistic Methods (2 2) Cr 3 F *Prereq 201 or equivalent professional work* Reporting complex issues situations and specialized topics for print and electronic media

510 Strategies of Communication (3-0) Cr 3 S SS *Prereq 501 or equivalent social science theory* The process of developing professional communication and persuasion strategies with emphasis on problem definition behavioral specification of objectives situation analysis strategy formulation and justification through application of communication theories and research results

***520 (320 DL) Principles of Public Relations** (3-0) Cr 3 F *Prereq 6 credits in social science* Public relations in business and other organizations functions process and management attitudes public opinion and persuasion tools of the public relations and corporate communications practitioner management of change in contemporary society

521 Information Program Methods Audio-Visual (2 2) Cr 3 F *Prereq 6 credits in social science and permission of instructor* Theories in visual communication from aesthetic to psychological Use of Gestalt theory to examine effects of visual messages including cross-cultural communication Emphasis on analyzing visual images in print and electronic media

***524 (424 DL) Public Relations Campaigns** (3-0) Cr 3 S *Prereq 520* Development of public relations and corporate communications campaigns for business and social institutions Projects involve budgeting media selection campaign strategy and creative execution

***534 (434 DL) Advertising Campaigns** (3-0) Cr 3 S *Prereq 334 335 and permission of instructor* Development of advertising campaigns for business and social institutions Projects involve budgeting media selection market analysis campaign strategy and creative execution

***547 (347 DL) Science Writing** (2-2) Cr 3 S *Prereq 6 credits in science and permission of instructor* Reporting and writing newspaper and magazine articles about science medicine and technology

561 Media and Society Interrelationships (3-0) Cr 3 F *Prereq 6 credits in social science* The media and their functions in a democratic society conflicts between the media and social institutions legal social and political controls on the media First Amendment theory

***574 (474 DL) Impact of Communication Technology on People and Societies** (3 0) Cr 3 F *Prereq 6 credits in social science* Seminar on present and potential effects of increasingly sophisticated modes of mass communication on people institutions and societies

***576 (476 DL) World Communication Systems and International Development** (3-0) Cr 3 F *Prereq 6 credits in social science* World communication systems newsgathering and dissemination agencies factors determining flow and volume of news Comparative analysis of role of traditional and mass media in developed and developing countries

590 Special topics Cr arr *Prereq Permission of instructor*

- A Media Studies
- B Professional Specialization
- C Problems and Methods
- D Technique and Style
- E Specialized Communication

591 Professional Internship (0 6) Cr 2 F S SS *Prereq 201* Supervised internship experience *Credits are to be applied in excess of the number required for graduation*

599 Creative Component Cr var *Prereq Approved proposal*

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*For information on dual listed (DL) courses see page 119

Courses for Graduate Students, major or minor

601 Introduction to Graduate Study in Journalism and Mass Communication (1-0) Cr R F *Prereq Graduate classification* Overview of advanced study in journalism and mass communication with special emphasis on requirements for obtaining the master of science degree

650 Seminars in Mass Communication Cr 1 to 3 each

- A Audiences and Effects
- B Communication Technology
- C Professional Communication
- D Development Communication
- E Evaluation Methods
- F International Communication
- G Mass Communication History
- H Mass Communication Law
- I Media Management
- J Research Methods
- K Society and Mass Communication
- L Teaching Journalism and Mass Communication
- M Visual Communication
- N Broadcast Communication

699 Research Cr var

Landscape Architecture

Mark Chidister Interim Chair of Department

Professors Harvey Hightshoe Lane Rutledge

Emeritus Professor Dyas

Associate Professors Anderson Boon Chidister Crandell Dietrich Grundmann

Assistant Professors Badenhope, Engler

Undergraduate Study

For undergraduate curriculum in landscape architecture leading to the degree bachelor of landscape architecture see *College of Design Curricula*

The profession of landscape architecture is concerned with the quality of land use It involves analysis of environmental factors and human needs which leads to recommendations for the preservation design construction and maintenance of developed land areas Among the types of land development included in professional practice are park and recreation areas school grounds institutional grounds industrial sites commercial sites land subdivisions and residential properties The scale of such projects varies from broad regional landscape analysis and planning to detailed design

The curriculum is accredited by the American Society of Landscape Architects and provides the education which combined with experience is necessary for professional registration

The curriculum is composed of a two-year preprofessional program and a three-year professional program
Admission into the professional program depends upon available resources and is subject to the approval of a faculty committee at the completion of the preprofessional program Scholastic performance aptitude and personal development are the qualifications considered The department also cooperates in the undergraduate minor in design studies

Graduate Study

The department offers work for the degree master of landscape architecture with a major in landscape architecture Minor work is offered to students taking major work in other departments

The M L A degree is granted upon completion of 36 credits and the acceptance of a thesis or creative component Typically the program will require four semesters of study for students with a bachelor s degree in landscape architecture Students with a bachelor s degree in landscape architecture may also enter a special program to earn both the M L A and the master of community and regional planning (M C R P) degrees in three years after completing 60 credits of study Graduate students who do not possess a bachelor s degree in landscape architecture must complete additional coursework in the fundamental skill areas of the profession This is accomplished by concurrent enrollment in the undergraduate program to earn the B L A degree before fully engaging in graduate study The time necessary to earn the B L A in addition to the M L A will vary according to the student s background upon admission Students interested in the concurrent B L A /M L A and double degree M L A /M C R P programs should write the department to receive a detailed description of requirements

The department also participates in the interdepartmental minors in housing and mineral resources (See *Index*)

Open to graduate students for minor credit only 361 461 462 463

Courses Primarily for Undergraduate Students

201 Principles of Park Design (2 0) Cr 2 F Planning of sites for recreation with emphasis on meeting user needs and operating requirements Materials fee

241 Basic Landscape Architectural Design (0-9) Cr 3 F *Prereq Fr E 135 Art 109 concurrent enrollment in 284 recommended* The landscape architectural problem solving process development of aesthetic sensitivity and awareness of uniqueness of site Design process site analysis programming concept formation form making and communication presented in problems dealing with the design of outdoor pedestrian scale space Graphic techniques used in the development of landscape architectural projects reports and programs Field trips Materials fee field trip fee

251 Fundamentals of Site Grading and Construction (0 9) Cr 3 S *Prereq 241* Design and grading of sites space forming potentials of natural and artificial land forms Pedestrian and vehicular circulation requirements reading topography preparation of grading plans computation of earth volumes and land areas Design considerations for walks ramps steps low walls Introduction to highway and walkway alignments horizontal and vertical control principles of land drainage Pen and pencil drafting techniques for construction drawings Materials fee field trip fee

271 Landscape Architectural History (3-0) Cr 3 S Landscape design concepts as observed over time Outstanding works and significant personalities from pre-history through the 20th century with emphasis on western cultures Landscape design vocabulary and significant literature Social economic political and technical forces contributing to the development of landscape design styles Lectures readings abstracts reports Materials fee

284 Introduction to Landscape Architecture (2-0) Cr 2 F Noteworthy works areas of practice philosophies and approaches of landscape architects Lectures discussions and readings Materials fee

309 Field Travel Cr 1 each time taken F S *Prereq Enrollment in the professional program and permission of instructor* Observation of the professional practice of landscape architecture in urban rural and natural areas Offered on a satisfactory fail basis only Field trip fee

311 Presentation Techniques (0-6) Cr 3 F *Prereq Enrollment in the professional program* Preparation and execution of methods for effective and creative use of graphics for visual thinking and communicating landscape design solutions with emphasis on perspective drawings drawing media and personal expression Materials fee

321 Fundamentals of Planting Design I (0-9) Cr 3 F *Prereq Enrollment in the professional program* Native grasses forbs trees shrubs and vines of the Midwest used in landscape design Visual characteristics cultural requirements and ecological relationships Design applications emphasizing the space forming potentials of natural and man made plant groups Field trips Materials fee field trip fee

322 Fundamentals of Planting Design II (0-9) Cr 3 S *Prereq 321* Identification knowledge and appreciation of Eurasian plants emphasizing cultivated species and horticultural varieties including cultural characteristics Functional and aesthetic uses of plants selecting plants to meet specific site and problem requirements Planting plan preparation including development of simple installation details Field trips Materials fee field trip fee

335 Landscape Design Studio (0-12) Cr 4 each time taken maximum of 8 SS *Prereq Enrollment in the professional program* Development of solutions for landscape architectural problems at intermediate and advanced levels of design A maximum of 8 credits may be applied towards graduation as elective credit or substitution for a required studio with prior approval of the department Field trips Materials fee field trip fee

342 Intermediate Landscape Architectural Design I (0-12) Cr 4 F *Prereq Enrollment in the professional program* Development of design solutions of moderate complexity with emphasis on multi building sitings land grading sensitivity the space forming potentials of building groups and landscape structures and applications of social factors Presentation graphic techniques Field trips Materials fee field trip fee

343 Intermediate Landscape Architectural Design II (0-12) Cr 4 S *Prereq 342* Development of high quality detail design and articulation of form through an exploration of relevant sources of design inspiration Integration of the pragmatics with the poetic metaphysical and artistic aspects of landscape architectural design Emphasis on social/cultural factors site uniqueness and nontraditional graphic communication A diverse range of small scale projects including specific and conceptual projects traditional and contemporary problems Field trips Materials and field trip fees

344 Landscape Horticulture (Hort 344) (2-6) Cr 4 *Prereq Hort 241 or L A 321 recommended* Principles and practices of designing residential and small business landscapes Site analysis terrain alteration for drainage and aesthetics functional areas and circulation use of construction and plant materials for site development Basic drafting perspective drawing and plan refinement techniques Materials fee field trip fee

361 Landscape Inventory and Analysis (2 2) Cr 3 S *Prereq Enrollment in the professional program* Basic land use and natural resource data used in the landscape planning and design process Review of data characteristics landscape analysis techniques environmental impact assessment geographic information systems and their applications to site level and regional level problems Identifying opportunities and limitations of landscape characteristics in planning and design for human use Materials fee field trip fee

***411 (511 DL) Computer Graphics for Landscape Architecture** (0-6) Cr 2 F *Prereq 361 Dsn S 201* Application of computer graphics to landscape design planning and construction projects Software includes computer-aided design (CAD) geographic information systems (GIS) thematic mapping 3 D static and dynamic simulation charting and rendering Materials fee

423 Planting Design (0-12) Cr 4 F *Prereq 322* Preparation of planting designs plans and specifications for projects of increasing complexity Emphasis on Iowa landscapes with some sites in other regions also included Field trips Materials fee field trip fee

443 Advanced Landscape Architectural Design (0-12) Cr 4 F S *Prereq 452 Cannot be taken concurrently with 463* Development of design solutions of high complexity with emphasis on redesigning built landscapes and the interrelationship of pedestrian and vehicular circulation building groups utilities and natural systems Field trips Materials fee field trip fee

***444 (544 DL) Community Design and Sense of Place** (0 6) Cr 4 S *Prereq 343* Integration of theory techniques and applications related to small towns community design and public participation

Emphasis on understanding a town s sense of place and applying that understanding to the development of a townscape plan Field trips Field trip fee materials fee

452 Site Construction and Structures (2-6) Cr 4 F *Prereq 343* Solving complex site construction problems with an emphasis on the aesthetic and functional uses of building materials Characteristics and uses of construction materials Wood technology and structural theory paving systems retaining walls site and storm drainage systems water and irrigation systems mechanical and electrical systems site lighting Construction detailing and *preparation of contract documents* Field trip Field trip fee materials fee

453 Professional Practice and Procedures (2 6) Cr 4 S *Prereq 452* Organization and management of the design services office Development of the office organization budgeting and scheduling of projects preparation of proposals production and scheduling of construction drawings and *specifications* cost estimates and introduction to construction contract liability law Field trip Field trip fee materials fee

***461 (561 DL) Resource Conservation and Management** (2 0) Cr 2 F *Prereq 361* Exploration of landscape patterns and landscape ecology as a framework for land planning and use at local regional national and global scales Concepts and strategies that strive toward a sustainable earth society Lectures readings reports guest speakers Materials fee

***462 (562 DL) Studio in Resource Conservation and Management** (0 6) Cr 2 S *Prereq 461 (561 DL)* Developing plans and policies that feature ecological landscape description planning and resource conservation Hands on field experience with professional resource planners and managers Field trips Field trip fee materials fee

463 Comprehensive Landscape Planning (0 12) Cr 4 S *Prereq 461 Cannot be taken concurrently with 443* Planning for multiple use of large areas with emphasis on regional landscape analysis visual resource management landscape impact assessment and land use feasibility Preparation of master plans for multiple use with a basis in human ecology and landscape ecology *Master planning* methods and concepts communicated through drawings oral presentations and written reports Field trips Materials fee field trip fee

***464 (564 DL) Planning Landscapes for Wildlife** (2 3) Cr 3 S *Prereq 361* Introduction to principles of planning and design of wildlife habitat general wildlife habitat requirements local wildlife communities and habitat preservation techniques Design projects lectures oral presentations written reports Field trips Materials fee field trip fee

***472 (572 DL) Landscape Architectural History and Preservation** (3-0) Cr 3 F *Prereq 271* Research methods applied to the preservation and restoration of the historic landscape Outstanding landscape architectural works of the 18th 19th and 20th centuries will be used to familiarize students with methods of archaeological and documentary research technical problems of restoration and conservation and curatorial problems of interpretation and maintenance Lectures readings abstracts reports Field trip fee materials fee

490 Independent Study Cr 1 to 4 F S *Prereq Written approval of instructor and department chair on required form* Investigation of a topic of special interest to the student

A Landscape Design
B Planting Design
C Construction
D History
E Landscape Planning
F Urban Design
G Graphics
H Honors
I Interdisciplinary Studies
J International Studies
K Computer Applications

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 Seminar Cr 3 S *Prereq Two art history courses* Discussion of landscape design theories Evaluation of how the landscape is perceived how that perception is formed filtered and focused Materials fee

509 Mining Reclamation and Mitigation (Mn Rs 509) See *Mineral Resources*

***511 (411 DL) Computer Graphics for Landscape Architecture** (0-6) Cr 2 F *Prereq 361 DsnS 201* Application of computer graphics to landscape design planning and construction projects Software includes computer aided design (CAD) geographic information systems (GIS) thematic mapping 3 D static and dynamic simulation charting and rendering Materials fee

541 Principles of Research for Landscape Architects (3-0) Cr 3 F *Prereq 463* Examination of research methods appropriate to landscape architectural projects Readings discussions and application problems

544 (444 DL) Community Design and Sense of Place (1-6) Cr 4 S *Prereq 343* Integration of theory techniques and applications related to small towns community design and public participation Emphasis on understanding a town s sense of place and applying that understanding to the development of a townscape plan Field trips Field trip fee materials fee

***561 (461 DL) Resource Conservation and Management** (2 0) Cr 2 F *Prereq 361* Exploration of landscape patterns and landscape ecology as a framework for land planning and use at local regional national and global scales Concepts and strategies that strive toward a sustainable earth society Lectures readings reports guest speakers Materials fee

***562 (462 DL) Studio in Resource Conservation and Management** (0 6) Cr 2 S *Prereq 561or 461* Developing plans and policies that feature ecological landscape description planning and resource conservation Hands-on field experience with professional resource planners and managers Field trips Field trip fee materials fee

***564 (464 DL) Planning Landscapes for Wildlife** (2 3) Cr 3 S *Prereq 6 credits in biological sciences* Introduction to principles of planning and design of wildlife habitat general wildlife habitat requirements local wildlife communities and habitat preservation techniques Design projects lectures oral presentations written reports Field trips Field trip fee materials fee

***572 (472 DL) Landscape Architectural History and Preservation** (3-0) Cr 3 F *Prereq 271* Research methods applied to the preservation and restoration of the historic landscape Outstanding landscape architectural works of the 18th 19th and 20th centuries will be used to familiarize students with methods of archaeological and documentary research technical problems of restoration and conservation and curatorial problems of interpretation and maintenance Lectures readings abstracts reports Field trip fee materials fee

580 Tutorial Cr 4 F S *Prereq Permission of major professor* Hands-on participation in a creative or research activity in the student s area of specialization Development of a detailed prospectus that defines the thesis or creative component

582 Research Colloquium (1 0) Cr 1 F *Prereq Senior or graduate classification in the College of Design* Examination and discussion of professional practice research in landscape architecture and environmental planning through research and projects by faculty in landscape architecture and related fields Materials fee

590 Special Topics Cr 1 to 4 F S *Prereq Written approval of instructor and department chair on required form*

A Landscape Design
B Planting Design
C Construction
D History
E Landscape Planning
F Urban Design
G Graphics
H Honors
I Interdisciplinary Studies
J International Studies
K Computer Applications

599 Creative Component Cr var F S SS *Prereq 580 582 and permission of major professor* Comprehensive study and original development of a project selected by the student and approved by the department Completed project must be submitted to and approved by a graduate faculty committee as evidence of mastery of the principles of landscape architecture

Course for Graduate Students, major or minor

699 Thesis Research Cr var F S SS *Prereq 580 582 and permission of major professor*

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*See page 119 for information on dual listed courses

Liberal Arts and Sciences Cross-Disciplinary Studies

Zora D Zimmerman Associate Dean for Academic Programs

Cross-disciplinary studies in the College of Liberal Arts and Sciences encompass programs of study and courses that cross *established departmental lines*

Major in Interdisciplinary Studies

A major in interdisciplinary studies is offered in the College of Liberal Arts and Sciences for undergraduate students who have interdisciplinary *educational goals that cannot* be met by an existing major or curriculum in a single department Leading to either the bachelor of arts or the bachelor of science degree this major includes 36 to 48 credits of coursework chosen to provide a coherent carefully planned program in an area of interest that bridges two or more departments The major has a descriptive title reflecting its theme and content that appears in parentheses on the transcript and the diploma following the words *Interdisciplinary Studies*

A student seeking admission to the program in interdisciplinary studies writes a letter of application that explains how the major meets specific educational goals Applications are screened by a review board consisting of at least two faculty members plus members of the dean s staff The application must be accompanied by a degree program and a letter of support from an adviser who is competent in the student s area of interest In most cases the adviser will be a faculty member in the college or the coordinator of the pre-professional health programs (for those students preparing for professional schools in health fields) Because students are expected to earn at least 30 credits after the semester in which admission to the *program is approved the proposal is* ordinarily submitted to the panel in the sophomore or junior year

No major will be approved if the area of interest properly falls under the purview of

another college or if the student s educational goals can be accommodated by a reasonable combination of existing majors minors and electives

The interdisciplinary studies major must satisfy the following requirements

A Students must satisfy the requirements of the liberal arts and sciences curriculum in the College of Liberal Arts and Sciences With the approval of the review board the student will identify courses leading to either the B A or the B S degree (A major emphasizing the humanities or communicative arts normally leads to a B A a major emphasizing the natural or social sciences normally leads to a B S) Specific requirements for the B A and B S degrees are the following

1 After meeting the minimum foreign language requirement students declaring a major that leads to a bachelor of arts degree may be required to earn credit for an additional two semesters of a foreign language at the college level or to spend a semester in a study abroad program

2 In meeting the requirement in the mathematical disciplines (Group IIIA) students declaring a major that leads to a B S degree may be required to earn credit in either Math 160 (or a higher level calculus course) or Stat 101 104 or 105 (or a higher level statistics course)

3 In meeting the requirements in the natural sciences (Group IIIB) students declaring a major leading to a B S degree may be required to complete a two-semester sequence in the natural sciences including a course with a laboratory component

B Courses listed in the major may come from any department of the university with the following restrictions

1 The selection of courses must focus on a single theme and be consistent with the career and educational goals of the student

2 At least one half of the courses must come from degree-offering departments within the College of Liberal Arts and Sciences

3 The courses must be chosen from at least two disciplines

4 The courses in the major must be numbered 200 or higher At least 24 credits must be taken in courses at the 300 level or above and a minimum of six credits must be taken at the 400 level or above The college requirement that the degree program include at least 47 credits at the 300 level or above must also be met

5 A grade of C or better must be earned in 15 credits at the 300 level or higher in the major in courses taken at Iowa State University

C The following English proficiency requirements must be met

1 Grades of B or better must be earned in Engl 104 and 105 If a grade of B– or lower is earned in either of these courses an additional writing course must be taken (for example Engl 204 302 305 309 or 314) and a grade of C or higher earned (This is in addition to the requirement described below)

2 A grade of C or better must be earned in either an advanced English composition course or a course in the major with a significant writing component

Further information may be obtained from the college office

Cross-Disciplinary Programs

African American Studies Program (Minor only)

Program Committee Co-chairs M Sawyer G Tartakov

The African American studies program offers a cross-disciplinary approach to the study of the African American experience It is designed to provide students with the opportunity to learn of the African American contribution to American culture and to better prepare students to live in a racially and culturally pluralistic society In addition to the introductory interdisciplinary course (Af Am 201) the program includes courses in history sociology English and religious studies For further information see *Index African American Studies*

American Indian Studies Program (Minor only)

Program Committee Chair Jerry Stubben

The American Indian studies program promotes an awareness of the American Indian in cross cultural and cross-disciplinary perspectives It includes courses in anthropology English, history political science and sociology and should be especially valuable to students majoring in those areas in the College of Liberal Arts and Sciences The courses are also relevant to students in family and consumer sciences and education The courses in the American Indian studies program provide added background for students whose career interest may include multi-cultural education human services programming legal services or public administration For further information see *Index American Indian Studies*

Biological/Premedical Illustration Program (Major or minor)

Program Committee Chair Warren Dolphin

The biological/premedical illustration program allows students to combine studies in the biological and physical sciences and art This combination of studies prepares a student for a career in biological illustration and provides a good foundation for graduate work in medical/biological illustration elsewhere Much of the coursework is derived from the following departments and programs Art and Design Biology Botany Chemistry Design Studies Journalism and Mass Communication and Zoology and Genetics

Acceptance into the program is by application Information is available in 201 Bessey Hall For a description of the program and courses see *Index Biological/Pre-Medical Illustration*

Classical Studies (Minor only)

Program Committee Chair Madeleine Henry

The classical studies program is a cross-disciplinary program in the College of Liberal Arts and Sciences that offers an integrated curriculum in the languages literatures history and thought of ancient Greece and Rome from the time of the Homeric poems to the reign of the Emperor Constantine The program also encourages the study of the contemporaries and antecedents of classical culture such as the Near East and Mycenaean Greece and of its heirs in the Middle Ages and Renaissance For a description of the program and courses see *Index Classical Studies*

Criminal Justice Studies (Minor only)

Program Coordinator Martin G Miller

The criminal justice studies minor a cross-disciplinary course of study in the College of Liberal Arts and Sciences offers an opportunity for students to learn about the components of the criminal and juvenile justice systems to become acquainted with the issues and problems affecting those systems to apply theoretical concepts to real world problems and to plan a career in criminal or juvenile justice

Students who declare a minor in criminal justice studies are required to complete an orientation course and a professional seminar a core curriculum a practicum and electives based on specific career interests In consultation with the program coordinator, students select six credits of electives based on career interests such as law enforcement probation and parole correctional counseling justice agency administration and justice planning and research Students should contact the program coordinator for information and program planning

Environmental Studies (Minor or second major)

Coordinator G Atchison

The environmental studies program at Iowa State University presents an interdisciplinary problem-focused approach to the interaction between nature and environmental systems on the one hand and humankind s social and cultural systems on the other It encompasses many other fields including environmental sociology environmental economics environmental politics and policies environmental planning environmental law environmental education environmental ethics and environmental history A minor second major or elective coursework in environmental studies may be chosen by students pursuing careers related to the environment or others who simply want to know more about environmental issues For more information see *Index Environmental Studies*

International Studies Program (Second major or minor)

Program Committee Chair Steffen Schmidt

The College of Liberal Arts and Sciences offers a major with a geographical area concentration in African and Middle Eastern studies Asian studies British studies, Latin American studies Central European and Eurasian studies and Western European studies The area studies major provides a background for individuals interested in careers in international business journalism multicultural education foreign service, development banks advocacy organizations or private and public agencies of international development Furthermore an area studies major contributes to a sound liberal arts education A student majoring in one of the designated areas must demonstrate a minimum of two years college-level proficiency in one appropriate foreign language Students must choose 18 credits in courses pertinent to the area with a maximum of nine credits allowed in one discipline and coursework in at least three disciplines See *Index International Studies*

Linguistics Program (Major or minor, graduate minor)

Program Committee Chair Roberta Abraham

A major or minor in linguistics may be elected by students in the curriculum in Liberal Arts and Sciences who are interested in the study of human language and want to design an integrated multidisciplinary program from courses offered by the departments of Anthropology Child Development English Foreign Languages and Literatures Philosophy Psychology Sociology and Speech Communication For further information see *Index Linguistics*

Religious Studies Program (Major or minor)

Program Committee Chair G Comstock

Religious studies gives students the opportunity to investigate and reflect on the religions of humankind in an objective critical and appreciative manner Though there is emphasis in religious studies on the wide variety of religious phenomena as well as on the various methods in the study of religion the aim is to help students to develop their own integrated understanding of the nature of religion and its role in personal and social life For further information see *Index Religious Studies*

Women's Studies Program (Minor only)

Program Committee Chair Kathleen Hickok

The women s studies program is designed to provide an opportunity for students to examine the contributions experiences and roles of women from a feminist perspective It includes courses in art history classical studies economics English foreign languages and literatures history physical education political science psychology sociology zoology and women s studies Students electing a minor or an interdisciplinary studies major in women s studies should contact the chair of the Women s Studies Program Committee Undergraduate students may minor in women s studies by taking 15 semester credits of women s studies classes including W S 201 301, or 401 See *Index Women s Studies*

Many women s studies courses are applicable to the human relations requirement for teachers See *Index Professional Teacher Education Requirements*

The Honors Program in Liberal Arts and Sciences

Program Committee Chair Charles Meyer

The honors program is intended for students who have a 3 35 grade point average or higher and wish to be challenged An honors student who completes his or her honors program will have that accomplishment recorded on the official transcript and on the diploma Honors students are expected to take two honors courses and two honors seminars to complete a program consistent with the honors guidelines and to complete an honors project For further information call or visit the Honors Program Office at Osborn Cottage or the college office

Premedical and Preprofessional Health Programs

Coordinator Heidi Saikaly

The premedical and professional health programs are designed for those students who are preparing for admission to medical school and professional schools in medically related fields Students who plan to earn a baccalaureate degree from Iowa State University will enroll in one of the departments of the university in their first or second year of study Other students will transfer to a professional school before earning the baccalaureate degree Coursework is individually tailored to fit the admission requirements of the professional schools and the interests of the student For further information see *Index Preprofessional Study*

Teacher Education Program

Coordinators Thomas Greenbowe Paul Kaufmann

Students interested in preparing for careers as secondary school teachers of basic academic subjects follow a course of study jointly administered by the College of Liberal Arts and Sciences and the College of Education The program prepares students in the liberal arts tradition of breadth with a specialization while assuring that students also receive preparation in the professional education courses necessary for certification

Teacher licensure programs offered by the College of Liberal Arts and Sciences include biology chemistry earth sciences English various foreign languages general science mathematics music physical science physics several areas within social studies and speech communication Students seeking licensure in one of these areas need not declare a major in the area although those enrolled as undergraduates normally do so Those who have earned a bachelor s degree and who only seek licensure usually enroll as nondegree students and need not pursue a second bachelor s degree, although they may do so

Students must make formal application to the Teacher Education Committee of the College of Liberal Arts and Sciences and be approved by the University Committee for Teacher Education in order to be admitted to the teacher education program Applications must be submitted no later than October 1 for spring and March 1 for fall registration in SecEd 301 (El Ed 301) For full admission to the program candidates must have a cumulative grade point average of 2 5 must register with the College of Education to take the Preprofessional Skills Test and must have an interview with the coordinator of the subject area in which they plan to teach Only after admission to the program are students allowed to enroll in the required 300- and 400-level professional courses in the Department of Secondary Education

Undergraduates in the teacher education program who meet the graduation requirements of their major department and the College of Liberal Arts and Sciences who meet the subject area requirements listed elsewhere under *Teacher Education Courses and Programs* and who meet the general education as well as the professional course requirements of the College of Education will be recommended for an Iowa Provisional Teaching License by the College of Education when they graduate This certificate qualifies graduates for full time teaching in the secondary schools of Iowa and usually in other states Students who already hold a bachelor s degree need not meet the LAS general education requirements

For details about the teacher education course requirements the subject areas of specialization and the names of the area coordinators see *Teacher Education Courses and Programs*

Courses Primarily for Undergraduate Students

101 Orientation for Open Option Students (1-0) Cr R F S First 10 weeks Liberal Arts and Sciences staff Self responsibility and university procedures LAS general education requirements ISU departments and programs time management academic study skills adjustment to the university environment Required of all first year open option students Offered on a satisfactory fail basis only

104 Personal Career Development (2-0) Cr 2 F S *Prereq Sophomore classification* Comprehensive approach to personal career development intensive self analysis utilization of a computerized career exploration system examination of work in modern society and the impact of technology on the future of work exposure to job search skills necessary for career choice implementation

105 Orientation to Clinical Laboratory Sciences/Medical Technology (1 0) Cr 0 5 F First 8 weeks *Prereq Sophomore classification* Nature and responsibilities of the profession description of the clinical year and employment opportunities introduction to the areas of expertise Offered on a satisfactory fail basis only

111 Elementary Physical Science (2-4) Cr 4 S *For students in elementary education and child development* Topics are selected from astronomy geology meteorology physics and chemistry

230 Third World Cultures in Global Perspective (Anthr 230) (3-0) Cr 3 F S An introduction to understanding other cultures in today s world with a focus on contemporary life the arts and social issues in Latin America Asia and Africa Taught by a staff of cross-disciplinary faculty and international resource persons

241 241H The World of Heroes in Greece and Rome (Cl St 241 241H) See *Classical Studies*

***290 Special Problems** Cr 1 to 3 each time taken *Prereq Freshman or sophomore classification permission of instructor*

417 Student Teaching (SecEd 417) Cr 8 to 12 each time taken F S *Prereq Engl 494 or F Lng 496 or Math 497 or Music 466 or LAS 492 or 493A and 493B or Sp Cm 495B admission to teacher education approval of coordinator during semester before student teaching* Evaluation of instruction lesson planning and teaching in the liberal arts and sciences

A History/Social Sciences
B Physical Sciences
C Mathematics
D Biological Sciences
E English and Literature
F Speech Communication
G Foreign Languages and Literatures
J Earth Sciences
K Music—Secondary
L Music—Elementary
M Science—Basic

480 Field Experience for Secondary Teaching Preparation (SecEd 480) Cr 1 to 2 each time taken maximum of 2 Observation and participation in a variety of school settings after admission to the teacher preparation program Permission of area coordinator required prior to enrollment

A History/Social Sciences
B Physical Sciences
C Mathematics
D Biological Sciences
E English and Literature
F Speech Communication
G Foreign Languages and Literatures
J Earth Sciences
K Music

492 Methods of Teaching Science (SecEd 492) (6-0) Cr 3 F S First 3 weeks *Prereq Admission to teacher education 15 credits in subject matter field* Topics include preparation for instruction spectrum of teaching methods motivational techniques safety discipline conducting field trips and application of teaching and learning theory Field trips

493A Methods of Teaching History/Social Sciences (SecEd 493A) (2-0) Cr 2 F *Prereq Admission to teacher education and 15 credits in subject matter field* Topics include objectives questioning strategies classroom activities curriculum development differentiating instruction and evaluation

493B Preparation for Student Teaching (SecEd 493B) Cr 1 First 4 weeks F S Developing materials for use in student teaching and observations at student teaching site Students taking 417A must also enroll in 493B

*These course numbers may be used only with the permission of the dean of the College of Liberal Arts and Sciences and concurrence by the Liberal Arts and Sciences Curriculum Committee

Library

Nancy L Eaton Dean of Library Services

Professors Eaton Sage

Emeritus Professors Cook Galejs Kuhn McNee Yates

Associate Professors Black Caswell Cole Dobson Lee Madison Mathews Morris Pelzer Roughton Rowley Van De Voorde Wendell

Assistant Professors Achebo Arcand Boydston Canelas Fry Fryer Gerhard Goedeken Gregory Hanthorn Hobert Lau Leysen Lopez McKiernan McMullen Osmus Parsons Pedersen Rebarcak Sanders Shonrock Sickles Vakili Walters Wiese Wool

Undergraduate Study

The library offers non-credit presentations for undergraduate students in the effective use of the library s resources The presentations cover electronic and print sources of information in varied fields Arrangements are made by individual course instructors

Graduate Study

The library provides non-credit presentations to assist faculty and graduate students in the effective use of the library s research resources The presentations cover electronic and print sources of information in varied fields For more information call the library s Reference and Instructional Services Department Offered F S SS For arrangements call the Library s Reference and Instructional Services Department

Courses Primarily for Undergraduate Students

160 Library Instruction (1-0) Cr 0 5 F S 8 weeks *Prereq for students whose native language is not English Completion of English 101 requirement* Use of libraries and information sources both print and electronic including locations and services of the University Library with an emphasis on the research process Offered on a satisfactory fail basis only To be taken as early as possible in the student s undergraduate career

Linguistics

(Interdepartmental Program)

Supervisory Committee R Abraham (Chair) J Anderson Hsieh C Chapelle D Douglas F Duffelmeyer J Hagge K Leonard B Matthies M O Boyle D Prince B Schwarte C Thogmartin R Vann H Venkatagiri D M Warren N Wolff

Undergraduate Study

The linguistics program is a cross-disciplinary program in the College of Liberal Arts and Sciences designed to meet the needs of students interested in various aspects of language—its structure history varieties meanings and uses The program includes courses in anthropology English computer science foreign languages and literatures philosophy psychology and speech communication thus providing a multi-disciplinary approach to the study of human language

Courses in linguistics serve as background for students interested in any career that involves working with language such as anthropology computer word processing foreign language teaching teaching English both as a first and as a second language, psychology sociology speech-language pathology and audiology

In the College of Liberal Arts and Sciences courses in linguistics can be applied as electives or as part of the group requirements They may also be used in a minor or in a major

Majors in linguistics complete a minimum of 33 hours in courses from the list below Courses specifically required are Lng 219 271 309 419 either 491 or 515 and either 420 or 492 To graduate with a major in linguistics a student must earn a C (not a C -) or better in each of the courses taken to fulfill the minimum requirements of the program of study in linguistics Students who believe they have extenuating circumstances may appeal to the chair of the supervisory committee In addition majors in linguistics must show proficiency in a foreign language equivalent to that achieved after two years of university-level study

Minors in linguistics are usually individually tailored to the interests of the student who consults with the chair of the supervisory committee for linguistics All minors must have a minimum of 15 credits in linguistics, of which 6 must be in courses numbered over 300 All programs must include Lng 219 or 309

English proficiency requirement The linguistics program requires a grade of C or better in English 104 and 105 (or 105H) and English 204 305 or 314 or an F Lng 370 course

For information about using linguistics courses in an interdisciplinary studies major see *Liberal Arts and Sciences Cross-Disciplinary Studies*

Graduate Study

A graduate minor in linguistics is offered through a cooperative agreement with the departments of Anthropology Computer Science English Foreign Languages and Literatures Psychology and Speech Communication The minor permits students to investigate a variety of aspects of linguistics emphasizing the ability to think about language in a systematic and disciplined way and to apply the methods of the field to research problems in their own disciplines

For the master's degree a declared minor consists of 9 credits in linguistics including two foundation courses (511 and either 515 or 516) and one elective from the list of courses approved for graduate credit For the Ph D degree the minor consists of 12 credits in linguistics including three foundation courses (511 515 and 516) and one elective It is recommended that the elective course be taken in a department other than English

At least one member of the linguistics faculty will serve on a student's program of study committee A list of faculty members may be obtained from the chair of the supervisory committee Ph D candidates will write one section of the preliminary examination on an area of linguistics All students in the minor are expected to attend linguistics lectures and colloquia Students in English with a specialization in Teaching English as a Second Language/Linguistics are not eligible for a graduate minor in linguistics

The following courses may be used in graduate programs with the approval of the student s program of study committee Lng

305 331 341 370 413 420 425 470 471 491 492 494 496

Courses Primarily for Undergraduate Students

207 Introduction to Symbolic Logic (Phil 207) See *Philosophy*

219 Introduction to Linguistics (Engl 219) See *English*

220 Applied English Grammar (Engl 220) See *English*

271 Phonetics (CmDis 271) See *Speech Communication*

275 Introduction to Communication Disorders (CmDis 275) See *Speech Communication*

286 Basic Sign Language (CmDis 286) See *Speech Communication*

305 Semantics (Sp Cm 305) See *Speech Communication*

309 Linguistic Anthropology (Anthr 309) See *Anthropology*

325 Nonverbal Communication (Sp Cm 325) See *Speech Communication*

331 Theory of Computing (Com S 331) See *Computer Science*

341 Women Men and the English Language (Engl 341) See *English*

370 Speech and Hearing Mechanism (CmDis 370) See *Speech Communication*

413 Psychology of Language (Psych 413) See *Psychology*

***419 (516 DL) English Syntax** (Engl 419 516 DL) See *English*

420 Origins and Development of the English Language (Engl 420) See *English*

425 Second Language Acquisition (Engl 425) See *English*

470 Speech and Hearing Science (CmDis 470) See *Speech Communication*

471 Language Development (CmDis 471) See *Speech Communication*

489 Undergraduate Seminar (Engl 489) See *English* Acceptable only when offered as a course in linguistics

490B Independent Study Linguistics Semantics (Engl 490B) See *English*

490D Independent Study Linguistic Anthropology (Anthr 490D) See *Anthropology*

491 Applied Linguistics for Foreign Language Teachers (F Lng 491) See *Foreign Languages and Literatures*

492 History of the Romance Languages (F Lng 492) See *Foreign Languages and Literatures*

494 Hispanic Dialectology (Span 494) See *Foreign Languages and Literatures*

***495 (518 DL) Teaching English as a Second Language Methods and Materials** (Engl 495 518 DL) See *English*

496 Contrastive Analysis of Spanish/English Syntax (Span 496) See *Foreign Languages and Literatures*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Language and Culture (Anthr 500) See *Anthropology*

511 Introduction to General Linguistics (Engl 511) See *English*

512 Historical and Comparative Study of the English Language (Engl 512) See *English*

513 Language and the Mind (Engl 513) See *English*

514 Language in Society (Engl 514) See *English*

515 Phonology (Engl 515) See *English*

***516 (419 DL) English Syntax** (Engl 516 419 DL) See *English*

517 Theoretical Foundations for Teaching English as a Second Language (Engl 517) See *English*

***518 (495 DL) Teaching English as a Second Language Methods and Materials** (Engl 518 495 DL) See *English*

520 Pedagogical Analysis of English (Engl 520) See *English*

589B Seminar Teaching English as a Second Language (TESL)/Linguistics (Engl 589B) See *English*

590 Special Topics (Anthr 590) See *Anthropology* Acceptable only when taught as a course in linguistics

590B Special Topics Teaching English as a Second Language (TESL)/Linguistics (Engl 590B) See *English*

598 Advanced Topics in Anthropology (Anthr 598) See *Anthropology* Acceptable only when taught as a course in linguistics

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*See page 119 for information on dual listed (DL) courses

Management

James C McElroy Chair of Department

Professors Chacko Hunger McElroy Morrow Wacker Wortman

Emeritus Professors Schrampfer

Associate Professors Aitchison Blackburn Chu B Flynn Nilakaanta Shrader

Assistant Professors E J Flynn Moser Premkumar Ramirez Sharp

Instructor Choobineh

Undergraduate Study

For undergraduate curricula in business administration major in management or management information systems (MIS) see *Business Curricula*

The Department of Management offers two majors (1) management and (2) management information systems In addition students complete the general education *requirements (including business foundation* courses) and business core requirements for the bachelor of science degree (B S)

Management is a broadly defined discipline and activity It is neither industry not function specific Management concepts theories techniques and skills are applicable to all business functional areas and are essential ingredients for success in all types of organizations The management activity requires sound conceptual technical and human skills for the effective utilization of organizational resources The management major at Iowa State University encompasses the diversity of management by providing students with alternative plans of study from which they can select a curriculum which most closely matches their interests with career opportunities

Within the management major students can select either a broad general management education or choose one of three specialized curricula small business management/ entrepreneurship employee and labor relations and production/operations management

The general curriculum, labeled **general business option,** enables students to gain a deeper understanding of the functional areas of business Students selecting this option are required to take the following five courses Acct 383 Fin 352 Mgmt 371 Mkt 447 and TrLog 460 These required courses are designed to expose a student to the technical behavioral and functional nature of businesses and the integrative nature of management Beyond this students may choose one additional course from an approved list to round out the 18-credit major Students may also choose to utilize elective credits to take other courses that are of interest beyond the 18 required credits

The **small business management/ entrepreneurship option** is designed for students interested in acquiring the technical and behavioral skills associated with managing a small business Because managing a small business is similar to managing large enterprises this curriculum contains many of the same courses as the general business option Students are required to take Acct 383 Fin 352 Mgmt 415 and Mkt 447 In addition students are allowed to select two additional courses from an approved list to complete the 18-credit major These two choice classes are designed to enable the student to tailor the major to their specific areas of interest

The **employee and labor relations option** allows students to focus on behavioral and labor issues surrounding the management of people in organizations Students choosing the option are required to take Mgmt 371 and 471 Econ 404 and 445 plus two additional courses selected from an approved list

Finally students may select the **production/operations management option** This option allows students to focus on the manufacturing and services operations of organizations Students are required to take four management courses Mgmt 418 422 371 and 471 plus two additional courses selected from an approved list

Management Information Systems (MIS), the second major offered by the Department of Management offers students comprehensive training in the application use and management of information systems to prepare them to provide effective information service and support to organizations Students selecting this major are required to take four courses Com S 201 Mgmt 335 430 and 432 These courses are designed to provide the technical and conceptual skills associated with the use of computers and information technology in business organizations Students complete the major by selecting two additional courses from an approved list These choice courses allow students either to increase their technical knowledge or to increase their knowledge of business in order to gain additional insights into problem solving within *organizations*

Graduate Study

The Department of Management participates in three graduate programs the M S in business administrative sciences the M B A

full-time day and part-time weekend programs and the interdisciplinary M S degree in industrial relations The M S in business administrative sciences is a 30-credit curriculum culminating in a thesis The M B A programs are 48-credit nonthesis noncreative component curriculum in which the first 24 credits are designed to be completed in lock-step fashion Finally the department is one of several participating departments offering coursework leading to an interdisciplinary M S in industrial relations

Open to graduate students for minor credit only Mgmt 413 414 415 422 430 432 438 479

Courses Primarily for Undergraduate Students

230 Microcomputer Applications in Information Systems (0-1) Cr 1 F S Hands-on microcomputer applications and problem solving in functional business areas Emphasis on basic computer skills using word processing spreadsheet and information systems concepts as applied to organizations

235 Management Information Systems (3 0) Cr 3 F S SS *Prereq Com S 103* The use of information technology at all levels of the organization Interaction of information systems with functional areas via applications Overview of methodologies for design and development of systems including decision support systems expert systems data bases end user computing etc Computer applications relate concepts to practice

318 Production/Operations Management (3-0) Cr 3 F S SS *Prereq Stat 227 Math 150 151 junior classification* An integrated analysis of basic production/operations systems Applied forecasting aggregate planning scheduling shop floor control total quality management inventory management facility layout and project management

335 File Structures and Programming (3-0) Cr 3 F S *Prereq 235 Com S 201* Introduction to the theory and use of data files and programming techniques in business environments Programming techniques associated with file management COBOL and SQL used extensively

370 Principles of Organization and Management (3 0) Cr 3 F S SS *Prereq Econ 201 or 206 and junior classification* Basic principles concepts and practices of management used in organizations

371 Individual Behavior in Organizations (3-0) Cr 3 F S SS *Prereq 370* Behavior of employees in work organizations motivation of individuals to join and perform in organizations and the relationship of employee satisfaction to elements of the work environment Emphasis on various management strategies for managing employee behavior

413 Venture Management (3-0) Cr 3 F *Prereq 370 Mkt 340 Fin 350* Study of the effective management of business ventures strategy formulation planning and controlling functions Emphasis on the unique aspects of venture management Feasibility study of an enterprise required

414 International Management (3-0) Cr 3 F *Prereq 370 Mkt 340 Fin 350* The nature and economic role of the multinational firm including the impact of legal political and cultural variables upon firm performance and managerial activity case studies illustrate interdependent nature of functional areas of business projected across national boundaries

415 Small Business Research (3-0) Cr 3 F S SS *Prereq 318 370 Acct 215 Mkt 340 Fin 350 TrLog 360* An examination and analysis of small business problems Development of strategic planning and problem solving skills related to small business management through field study

418 Inventory Planning and Control (3-0) Cr 3 F S *Prereq 318* Advanced operations management topics inventory management for independent and dependent demand systems and just in time systems

419 Social Responsibility of Business (3 0) Cr 3 S *Prereq 370 Mkt 340* A consideration of the role of business in society Critical analysis of ethical managerial and public issues as they affect the corporation

422 Manufacturing Planning and Control (3-0) Cr 3 S *Prereq 318* In depth analysis of integrated operations management systems with emphasis on operations planning and control material requirements planning master scheduling forecasting capacity planning and related topics

430 Database Management Systems (3-0) Cr 3 F S *Prereq 335 Com S 201* Database approach to data management in business computer information systems Data storage and structure hierarchic network and relational models and database administration

432 Information Systems Analysis (3 0) Cr 3 F S *Prereq 335 Com S 201* Systems analysis for computer based information systems Feasibility studies tools and techniques analysis of information flows input/output requirements analysis of business operations and systems design Uses CASE tools

438 Information Systems Development (3 0) Cr 3 F S *Prereq 430 432* Design of business applications using COBOL and CASE tools Functional information flows project management and analysis design development and documentation of business systems

471 Personnel and Human Resource Management (3 0) Cr 3 F S *Prereq 371* Acquisition utilization and development of people in organizations Examination of each personnel function interrelationships among the functions

478 Business Policy and Strategic Management (3-0) Cr 3 F S SS *Prereq 318 370 Fin 350 Mkt 340 TrLog 360 senior classification* Strategic concepts and policy issues in modern business emphasis on the role of executive decision making as simulated by the case study method

479 Management Seminar (3-0) Cr 3 S *Prereq Senior classification in management and permission of the instructor* Designed primarily for students interested in controversial issues in management Course utilizes advanced material and research drawn from topic areas within management

490 Independent Study Cr 1 to 3 each time taken *Prereq 370 senior classification permission of instructor*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

510 Business Ethics and Corporate Social Responsibility (3 0) Cr 3 F *Prereq Graduate classification* Designed to stimulate critical evaluation of business role in society ethical managerial governance and public issues as they affect the corporation

520 Operations Management (3 0) Cr 3 F S *Prereq Graduate classification* In-depth analysis of basic production/operations systems Applied forecasting aggregate planning scheduling shop floor control quality assurance inventory management human aspects of systems facility layout and project management

521 Total Quality Management (3 0) Cr 3 S *Prereq Stat 328 or equivalent graduate classification* Management and technical issues related to quality problem solving including the strategic importance and economic impacts of quality managerial issues in planning and designing quality assurance systems control of quality systems employee involvement statistical concepts relevant to designing for quality inspection and measurement process control and acceptance sampling Uses projects to experience diagnosing and solving real quality problems

525 Topics in World Class Manufacturing (3-0) Cr 3 F *Prereq 520 or equivalent* A detailed analysis of current literature on world class manufacturing Analysis of international manufacturing data analysis of current literature comparing similarities and differences in manufacturing management techniques

528 Manufacturing Information Systems (3-0) Cr 3 F *Prereq 520 530 or equivalent* Design of intelligent decision support systems for computer integrated manufacturing Systems requirements communications data structures and knowledge representation schemes for knowledge based manufacturing systems

530 Management Information Systems (3 0) Cr 3 S *Prereq Com S 103* Introduction to information systems in business including concepts and technology management support systems defining system requirements and managing information system resources

535 Management of Business Information Communications (3-0) Cr 3 S *Prereq 530 or equivalent* Issues involved in the management of business data communication from an information systems perspective Communications technology used in operating integrated business applications Impact of new telecommunications technologies on the management of the function as well as on the organization s business operations The life cycle approach to design of telecommunications systems and identification of various criteria that need to be considered in the design and management of complex business systems

539 Topics in Management of Information Systems (3 0) Cr 3 S *Prereq 530 permission of instructor* Information systems in action in organizations Topics may include in different semesters information resources management end user computing decision support systems modeling and expert systems and systems development methodologies

570 Organizational Behavior Outcomes (3-0) Cr 3 F SS *Prereq 371 BusAd 531 Psych 451* Advanced topics germane to the management of individuals and groups over their work lives sustained work commitment motivation and job/career satisfaction absenteeism turnover stress leadership and career development (e g career ladders mentoring)

571 Seminar in Personnel and Human Resources Management (3-0) Cr 3 S *Prereq 570* Topics and issues in personnel management with a focus on the management of human resources in organizations Current personnel practices philosophies and behavioral science research

575 Compensation Management (3 0) Cr 3 F *Prereq 571* Concepts techniques and issues dealing with remuneration of the work force The impact of government legislation as well as organizational and societal issues

576 Contemporary Topics in Agribusiness Management I (BusAd 576) (3-0) Cr 3 F *Prereq Graduate classification* Survey of contemporary issues in agribusiness management including theory techniques and practices Emphasis on nature of agribusiness management changing structures of agribusiness and relationship of business functions

577 Contemporary Topics in Agribusiness Management II (BusAd 577) (3-0) Cr 3 S *Prereq Graduate classification* Critical analysis of specific issues in agribusiness management with emphasis on environmental impact of agribusiness impact of international competition structure of agribusiness firms relationship to agricultural biotechnology and rural entrepreneurship

578 Strategic Management and Business Policy (3 0) Cr 3 F S *Prereq Mkt 540 Econ 511 Fin 550 Mgmt 510 520 530 570 Acct 580* Critical analysis of strategic management of organizations with emphasis on strategic decision making Reviews issues in business functional areas in light of environmental opportunities and threats Industry analysis competitive strategy strategy formulation and implementation evaluation and control

590 Special Topics Cr 1 to 3 each time taken F S SS *Prereq Permission of instructor* For students wishing to do individual research in a particular area of management

Marketing

James C McElroy Chair of Department

Professor Teas

Emeritus Professor Zober

Associate Professor Wong

Assistant Professors Agarwal Laczniak Ramaswami Sikri Walsh

Instructor Harms

Undergraduate Study

For undergraduate curriculum in business major in marketing see *College of Business Curricula*

In addition to the basic business requirements marketing majors must also complete Mkt 444 447 In addition to the required courses the major must take 12 credits of marketing or department-approved courses

Marketing is concerned with management decisions that deal with the satisfaction of consumer needs in the purchase and use of goods and services The primary decision areas in marketing involve the identification of *market segments and decisions dealing with* product design pricing promotion personal selling location of facilities and distribution A major in marketing prepares the student for careers in such areas as product management public relations industrial purchasing advertising and sales promotion marketing research personal selling and sales force management as well as for careers in nonprofit sectors of the economy such as charitable and government organizations Career opportunities are available for students who are skilled in either quantitative or behavioral techniques

Careers in the field of marketing include selling and sales management marketing research marketing management retailing promotion management health-care marketing service marketing and international marketing Each field of study may be applied to consumer industrial and service marketing in business and nonprofit organizations

Graduate Study

The Department of Marketing participates in two graduate programs the M S in Business Administrative Sciences and the M B A full-time day and part-time weekend programs The M S in business administrative sciences is a 30-credit curriculum culminating in a thesis The M B A programs are 48-credit nonthesis noncreative-component curricula in which the first 24 credits are designed to be completed in a lock-step fashion

Open to graduate students for minor credit only 444 448 449

Courses Primarily for Undergraduate Students

340 Principles of Marketing (3-0) Cr 3 F S SS *Prereq Econ 201 or 206 junior classification* The role of marketing in our society Markets marketing institutions and marketing functions with emphasis on product price marketing communication and marketing channel decisions

341 Marketing Management for Nonbusiness Students (3 0) Cr 3 F S *Prereq 340* Introduction to use of marketing techniques in analysis of business decisions dealing with pricing advertising personal selling product development and channels of distribution (For nonbusiness students only)

343 Personal Sales (3-0) Cr 3 *Prereq 340* Fundamentals of personal sales with emphasis on the importance of self confidence control in human interactions and sales techniques simulations of selling situations

410 Promotional Strategies (3 0) Cr 3 F S *Prereq Credit or enrollment in 447* Principles concepts and problems involved in development and management of promotion Coordination among a variety of promotional elements advertising personal sales public relations and sales promotions

442 Sales Management (3 0) Cr 3 F S *Prereq 340* Functional aspects of sales force management personal selling methods procedures for recruiting selecting and training new salespeople *compensation and expense control systems* problems of sales force motivation and supervision methods of territorial and quota assignment sales department budgets distributor-dealer relations other selected topics

443 Strategic Marketing Management (3-0) Cr 3 F S SS *Prereq 444 447* Analysis of major elements of strategic marketing management May include case studies or business simulations involving decision making using marketing tools from previous courses (For marketing majors only)

444 Fundamentals of Marketing Research (3 0) Cr 3 F S SS *Prereq 340 Stat 101 or 227* Marketing research techniques problem formation research design questionnaire construction sampling data collection procedures and analysis and interpretation of data related to marketing decisions

446 Retailing (3-0) Cr 3 F S *Prereq 340* Basic areas of retail management buying merchandising retail promotion store location store layout credit management and inventory control Emphasis on practical application of retail management principles

447 Fundamentals of Consumer Behavior (3 0) Cr 3 F S SS *Prereq 340* Study of the behavior of consumers Review of relevant literature that pertains to the consumption process Application of concepts and methods of the behavioral sciences to marketing management decision making

448 Fundamentals of International Marketing (3 0) Cr 3 F S *Prereq 340* Terms used in international marketing sources of information on international markets Development of sensitivity toward foreign business environment and familiarity with operations of multinational corporations

449 Marketing Seminar (3 0) Cr 3 *Prereq 340 and permission of instructor* Analysis of current issues and problems in marketing with emphasis on new theoretical and methodological developments At least one of the following seminars will be offered each academic year Additional seminars may be offered
A Health Care Marketing
B Services Marketing

490 Independent Study Cr 1 to 3 each time taken *Prereq 340 senior classification permission of the instructor*

491 Marketing Internship Cr 1 to 3 *Prereq Two marketing courses and permission of instructor*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

540 Marketing Management (3 0) Cr 3 F S *Prereq Econ 201 or 206 and Psych 101 or Soc 134 and permission of instructor* Strategic marketing and decision making with emphasis on cases utilizing qualitative and quantitative techniques and marketing models

541 International Marketing (3 0) Cr 3 F *Prereq 540 or BusAd 553* Scope and nature of global marketing operation the context of international environment in which firms operate Recent developments of international business activities and a framework for better understanding of the basic forces driving international business and marketing operations Development of market entry strategies and global marketing mix policies as well as export operations Organizational issues related to the globalization of the firm

542 Product Policy and Strategy (3-0) Cr 3 S *Prereq 540 or BusAd 553* Principles and concepts of new product development and introduction decision areas include market definition and structure idea generation concept evaluation test marketing launch tracking and global product planning models and techniques of new product evaluation used by consumer product companies

544 Marketing Research (3 0) Cr 3 S *Prereq 540 or BusAd 553 Stat 328 or 401* Marketing research methods are examined with emphasis on the use of advanced research methods in business research Application of advanced sampling measurement and data analysis methods in research on market segmentation market structure consumers perceptions and decision processes marketing communication new product development and pricing

547 Consumer Behavior (3-0) Cr 3 S *Prereq 540 or BusAd 553* The behavior of consumers Intensive review of literature from relevant disciplines Applications of concepts and methods of the behavioral sciences to marketing management decision making

590 Special Topics Cr 1 to 5 each time taken *Prereq Permission of instructor* For students wishing to do individual research in a particular area of marketing

Materials Science and Engineering

Krishna Vedula Chair of Department

Professors Akinc Berard Buck Gschneidner Jiles Kayser D Martin McGee Patterson Spitzig Thompson Trivedi Vedula Verhoeven

Emeritus Professors Carlson Larsen Peterson Smith Wechsler Wilder Wilhelm

Associate Professors Anderson McCallum S Martin

Assistant Professors Biner Chumbley, Constant Schilling

Undergraduate Study

Ceramic Engineering

For undergraduate curriculum in ceramic engineering leading to the degree bachelor of science see *College of Engineering Curricula*

Ceramic engineering deals with those products formed from natural and synthetic minerals which are rendered durable by a process of heat treatment at high temperatures These include most of the nonmetallic inorganic substances manufactured into electronic components glass of all types porcelain enamels abrasives cements ultrahigh temperature resistant refractories many materials of construction and other similar products

The ceramic engineer is concerned with the technical problems encountered in the

research development control production and use of these products and materials and must also be well versed in the methods employed for forming drying and firing of ceramic raw materials The ceramic engineer receives a well-rounded education to fit into research development production equipment and plant design or sales engineering depending upon the capabilities and inclination of the individual

Metallurgical Engineering

For the undergraduate curriculum in metallurgical engineering, see *College of Engineering Curricula* The curriculum is based on a core of courses in chemistry physics mathematics and metallurgical engineering principles A choice of electives makes it possible for students in consultation with their adviser to develop a program that best fits their particular interests and aptitudes Elective programs should complement the core curriculum avoiding undue specialization or aimless diversification

The department offers a cooperative education program usually requiring five years that combines classroom learning at the university with a minimum of one calendar year of work experience with an industrial company The first industrial part of the program follows the sophomore year See *College of Engineering Cooperative Programs*

The metallurgist or metallurgical engineer finds opportunities in many industries such as the metal producing refining and processing industries or those that utilize metals such as the automotive aerospace utilities electronic oil refining and farm implement industries Persons may choose to work in the areas of production sales or research Students interested in teaching or research in metallurgy or metallurgical engineering should seriously consider graduate study

Students in materials science and engineering who are interested in an area of technical specialization in nuclear engineering should take the following courses NucE 411 432 and 375 or 463

Graduate Study

The department offers work for the degrees master of science (with thesis) and doctor of philosophy with majors in ceramic engineering or metallurgy Students majoring in metallurgy may specialize in the areas of physical metallurgy chemical metallurgy and mechanical metallurgy Research in the department is administered through the Ames Laboratory IPRT centers and the Engineering Research Institute which provide support for graduate student research assistantships

Prerequisite to major graduate work is completion of an undergraduate curriculum in physical science or related engineering However well qualified juniors in metallurgical or ceramic engineering interested in graduate study can apply for concurrent enrollment in the Graduate College to simultaneously pursue M S and B S degrees Graduate assistantships can be awarded to students concurrently enrolled

Both M S and B S degrees can be obtained in five years of study under the concurrent enrollment plan

There are no foreign language requirements for any of the master s degrees administered by the Department of Materials Science and Engineering

For the degree doctor of philosophy with a major in metallurgy proficiency in a foreign language of technical merit is required This language may not be the student s native language The choice of language is subject to the approval of the Program of Study Committee Languages other than French German, Russian or Japanese must be approved by vote of the faculty Proficiency may be demonstrated by completing the 101-level language course with a grade of B or better or achieving a score of 525 in the Educational Testing Services examination or subject to prior approval of the faculty certification by a faculty member of a university foreign language department After satisfying the proficiency requirement, metallurgy majors must translate three journal articles (or their equivalent) the articles and translations are approved by the major professor The translations must be completed approved by the major professor and certified to the Graduate College by the department no later than six months prior to graduation

There is no departmental foreign language requirement for students seeking the degree doctor of philosophy with a major in ceramic engineering However students are encouraged to include the study of a foreign language as a part of their program

Graduate students with majors in the Department of Materials Science and Engineering interested in nuclear energy technology are encouraged to consider the following courses Nuc E 411 432 463 571 582 584 M S E 375 551 553

Graduate students wishing to declare a formal minor in ceramic engineering or metallurgy will have at least one M S E faculty member from the minor discipline serving on their advisory committee For the M S M E and Ph D degrees they will take a minimum of 8 12 and 12 M S E course credits respectively (at least 2 4 and 8 credits respectively at the 500 and 600 level)

The department participates in the interdepartmental minor programs in mineral resources and technology and social change (See *Index*)

Open to graduate students for minor credit only 305 306, 306L 307 307L 315 321 322 336 343 347 347L 360 370 370L 375 383 405 406 420 421 422 441

Courses Primarily for Undergraduate Students

170 Introduction to Materials Used in Art and Technology (3-0) Cr 3 F S A concept-oriented basic course on materials intended for students of all disciplines Development of appreciation for the scientific basis of materials properties and uses Emphasis on common applications of materials and their use in art and technology No science or mathematics background required

201 Principles of Materials Science (2-0) Cr 2 F S *Prereq Chem 167 or 177* Properties structure and bonding in solids Thermodynamic basis for equilibrium The role of defects in determining the physical and mechanical properties of solids Cast wrought and powdered materials Binary phase diagrams the nature and properties of alloys The heat treatment and properties of steels

202 Processing and Fabrication of Materials (3-0) Cr 3 S *Prereq Chem 167 or 177* Sources of raw materials for ceramics metals and polymers Processing of raw materials Materials handling and fluid flow Powder forming extrusion casting and advanced materials forming techniques Joining of ceramic metallic and polymeric materials Introduction to thermal processing

205 Introduction to Ceramic Materials (1 3) Cr 4 F *Prereq Credit or enrollment in 201* Crystal structure of ceramic materials bonding structures-properties relationships Physical properties of ceramic materials

206 Ceramics Processing and Fabrication Laboratory (1 3) Cr 2 S *Prereq Credit or enrollment in 202* Ceramic forming and processing technology Lecture and laboratory exercises in materials preparation forming and drying for ceramic materials Ceramic bodies and glazes

207 Introductory Physical Metallurgy Laboratory (1 3) Cr 2 F S *Prereq Enrollment in 201* Electrical properties of metals powder x ray diffraction temperature measurement hardness and tensile testing metallography (light microscopy) of ferrous and nonferrous metals and alloys

208 Metals Processing and Fabrication Laboratory (0-6) Cr 2 S *Prereq Credit or enrollment in 202* Metal forming processing and joining technology Laboratory exercises in casting and solidification mechanical working and annealing welding and powder processing

210 211 Seminar (1-0) Cr R Yr *Prereq Sophomore classification in ceramic or metallurgical engineering* Professional development and student activities

271 Materials Science and Engineering (3-0) Cr 3 F S *Prereq Chem 167 or 177 Math 166 Phys 221* Introduction to atomic bonding structure of crystals and polycrystalline aggregates imperfections and diffusion dislocations and mechanical properties phase transformations and thermal processing structure and properties of metals ceramics and polymers Corrosion Electrical thermal magnetic and optical properties Engineering applications

298 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative students Students must register for these courses prior to commencing each work period

305 Kinetics of Microstructure Development (4 0) Cr 4 F *Prereq 201 and 205 or 207 202 and 206 or 208* Solidification from the melt of pure materials and alloy mixtures Crystal nucleation growth and influence on mechanical properties Crystal structures and defects Diffusion in metals and ceramics

306 Physical Metallurgy (4-0) Cr 4 S *Prereq 305* Ternary phase equilibria Plastic deformation Recovery recrystallization and grain growth Second phase nucleation precipitation and growth Cast irons and steels Twinning and martensite transformations

306L Physical Metallurgy Laboratory (1-6) Cr 3 S *Prereq Credit or enrollment in 306 and knowledge of FORTRAN programming* Experiments are designed and carried out that involve the following topics Carburizing of steel casting of bronze brass and cast iron Jominy end quench induction hardening x-ray and metallographic evaluation of retained austenite and age hardening of aluminum alloys Materials fee

307 Pyrometry and Thermal Processing of Ceramics (3-0) Cr 3 S *Prereq Phys 221 Chem*

167 or 177 Principles of temperature measurement thermoelectric resistive and optical devices Ceramic firing interpretation of phase diagrams Detailed analysis of silicate systems liquid and solid state sintering grain growth

307L Pyrometry and Thermal Processing Lab (0-6) Cr 2 S *Prereq Credit or enrollment in 307* Laboratory exercises in temperature measurement fuels and combustion and high temperature firing of ceramics Sintering solid-solid reactions and vitrification Furnace operation and thermal analysis Statistical analysis

310 311 Seminar (1-0) Cr R Yr *Prereq Junior classification in ceramic or metallurgical engineering* Professional development and student activities

315 Instruments for Materials Characterization (2 3) Cr 3 F *Prereq Phys 222* Characterization of materials with information obtained from light microscopy x ray diffraction scanning electron microscopy and x-ray spectroscopy Correlation with microstructures Statistical analysis

321 Mechanical Behavior of Materials (M E 321) See *Mechanical Engineering*

322 Manufacturing Processes (M E 322) See *Mechanical Engineering*

336 Engineering Materials (E M 336) See *Engineering Mechanics*

340 Inspection Trip Cr R S *Prereq Junior ceramic engineering classification* One week trip inspecting ceramic plants and studying industrial methods of production Field trip fee

341 Application of Statistics to Materials (2-0) Cr 2 S Application of statistical principles to problems concerned with materials Computer assisted design of experiments

343 Electronic Properties of Materials (4-0) Cr 4 F *Prereq 201 205 or 207 Phys 222* Underlying causes and characteristics of electrical and magnetic behavior of materials Properties and production of common materials used for dielectric optical semiconductor metallic and ionic conductor and magnetic applications

347 Vitreous State (3-0) Cr 3 S *Prereq 305* Theory of the vitreous state Structure and properties of inorganic glasses Melting forming annealing and properties measurements Glass/metal systems

347L Vitreous State Laboratory (0 3) Cr 1 S *Prereq Credit or enrollment in 347* Experiments on batching melting refining and annealing glass Physical properties measurements index of refraction density elastic modulus stress optic coefficient etc Glass/metal seals enamels

360 Thermochemistry for Materials Science and Engineering (3-0) Cr 3 F *Prereq Chem 167 or 177 Math 265* Basic laws of thermodynamics applied to materials systems Thermodynamic properties of pure substances homogeneous solutions and dissolved components Homogeneous and heterogeneous equilibrium Property changes for chemical reactions

370 Principles of Nondestructive Testing (E M 370) (3-0) Cr 3 S *Prereq Phys 112 or 222* Radiography ultrasonic testing magnetic particle inspection eddy current testing dye penetrant inspection and other less common techniques Physical bases of tests materials to which applicable types of defects detectable calibration standards and reliability safety precautions

370L Nondestructive Testing Laboratory (E M 370L) (0 3) Cr 1 S *Prereq Credit or enrollment in 370* Application of nondestructive testing techniques to the detection and sizing of flaws in materials Field trip fee

371 Materials for Aerospace Applications (3 0) Cr 3 F *Prereq Chem 167 E M 324* Introduction to *atomic structure of solids phase equilibria* transformations and mechanical properties Selection and properties of aerospace materials Primarily for aerospace engineering students

375 Nuclear Materials and Radiation Effects (Nuc E 375) (3 0) Cr 3 F *Prereq 201 or 271* Survey of materials for fission and fusion reactors Current materials topics in nuclear technology Nuclear fuel and fuel cladding materials Pressure vessels for light water reactors Steam generators Fusion reactor first wall Defects in solids Radiation damage to materials

383 Polymers and Composites (3-0) Cr 3 F *Prereq Chem 167 or 178 E M 324* Properties of polymers as a function of chemical composition atomic arrangement and molecular architecture Processing fabrication and properties of thermoset polymers thermoplastic polymers glass reinforced plastic boron epoxy composites and graphite epoxy composites

397 Engineering Internship Cr R F S *Prereq Permission of department* Professional work period one semester maximum per academic year

405 Mechanical Behavior of Materials (2 3) Cr 3 S *Prereq E M 324* Fundamentals of mechanical behavior of metallic ceramic and polymeric materials including composites Lecture and laboratory exercises in elasticity and plasticity static and time dependent fracture creep stress-rupture residual stresses Design problems

406 Mechanical Metallurgy (3 3) Cr 4 F *Prereq 405* Mechanical behavior of metals Elasticity plasticity failure and fatigue Emphasis on *engineering applications and design* Metal forming and processing

410 411 Seminar (1 0) Cr R Yr *Prereq Senior classification in ceramic or metallurgical engineering* Professional development and student activities

420 Design for Thermal Processing (1-6) Cr 3 F *Prereq 305 360* Design and analysis of heat treatment and other transport dependent processes pertaining to metal ceramic or polymer processing and utilization Experimental verification Computer modeling and analysis *Oral and written reports*

421 Metallurgical Engineering Design (3 0) Cr 3 S *Prereq 406* Application of economic physical chemical and mechanical metallurgical principles to design of metal parts and processes Oral and written reports Field trip fee

422 Ceramic Engineering Design (1 6) Cr 3 S *Prereq 420* Major problems and projects in the design of ceramic materials and processes Oral and written reports

441 Manufacture and Application of Refractories and Structural Ceramics (3 0) Cr 3 F *Prereq 306 or 307 360* Thermal properties of ceramic materials Refractories classification selection and manufacturing Applications Structural ceramics

490 Independent Study Cr arr Investigation of individual research or special topics
A Metallurgy Materials fee
B Ceramic Engineering Materials fee
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 Thermodynamics of Physico chemical Processes in Solids (3-0) Cr 3 F *Prereq 306 or 307 360 or Chem 321 Math 266* Review of basic principles thermodynamics of multiphase chemical reactions thermodynamic potentials stability principles solution thermodynamics free-energy composition diagrams multicomponent phase diagrams and thermodynamic driving forces Nucleation and spinodal decomposition theory

502 Kinetics of Physical Metallurgical Reactions (3 0) Cr 3 S *Prereq 501* Mechanism of diffusion Phenomenological aspects Diffusion applied to kinetic processes Anelasticity Precipitation and segregation reactions Recovery and recrystallization Order-disorder reactions Displacive transformations

503 Mechanical Behavior of Materials (3 0) Cr 3 F *Prereq 305 Math 266* Mechanical behavior of materials based on atomic and microstructural considerations Elasticity plasticity yield criteria introduction to dislocation theory Brittle and ductile fracture fatigue and creep design criteria statistical aspects of failure

508 Mineral Processing Operations (Mn RS 508 Ch E 508) See *Mineral Resources*

512 Introductory Metal Theory (2 0) Cr 2 Alt S offered 1995 *Prereq Phys 222 Math 266* Free electron theory and band theory Brillouin zones and Fermi surfaces electronic conductivity and scattering processes electronic heat capacities and comparison of metals to semiconductors

514 Applications of Metallurgical Thermodynamics (2 0) Cr 2 Alt F offered 1993 *Prereq 360 or Chem 321* Solubility of gases in metals oxidation of metals and alloys thermochemistry of steelmaking atmosphere control with gas mixtures special applications of Clausius Clapeyron equation use of Richardson Jeffes charts thermodynamics of alloys

520 Chemical and Physical Metallurgy of Rare Earths (2 0) Cr 2 Alt F offered 1994 *Prereq 306 or Phys 325 360 or Chem 321* Electronic configuration valence states minerals ores beneficiation extraction separation metal preparation and purification crystal structure transformation melting and boiling points chemical behavior inorganic compounds alloy chemistry nature of the chemical bond mechanical and elastic properties magnetic properties resistivity and superconductivity

521 Polymers and Composites (M E 521) See *Mechanical Engineering*

522 Structure Properties and Heat Treatment of Ferrous and Non ferrous Alloys (3-0) Cr 3 F *Prereq 306* Application of fundamental concepts of phase transformations heat flow mechanical behavior and structure property relations to the problems of heat treatment and selection of steels and aluminum copper and titanium alloys

523 Corrosion and Oxidation (3 0) Cr 3 S *Prereq One course in thermodynamics* Study of origin development and current applicability of theories of corrosion and oxidation of metals

524 Casting and Welding of Metals (3-0) Cr 3 Alt S offered 1994 *Prereq 305* Dendritic growth and control of macrostructure in castings ingots and continuous cast metals Porosity and its control Riser and gating design Mechanical properties of cast metals Welding characteristics of steels and important non-ferrous alloys

525 X-Ray Diffraction (3-0) Cr 3 S *Prereq 315* Introduction to theory of X ray and neutron diffraction symmetry operations space groups and reciprocal lattice Laue and powder diffraction methods and their application to precise lattice parameters determination of simple crystal structures phase identification orientation texture grain size strain residual stress and order-disorder

550 Fundamentals of Nondestructive Evaluation (E M 550) See *Engineering Mechanics*

551 Nuclear Reactor Materials and Radiation Effects (Nuc E 551) (3 0) Cr 3 F *Prereq 375* Radiation flux and spectrum and cross section Defects in materials Theory of collisions and displacement production Experimental observation of radiation damage Defect clusters voids and bubbles Radiation hardening and embrittlement Current materials issues in fission and fusion reactor technology

553 Nuclear Reactor Fuel Materials (Nuc E 553) (2-0) Cr 2 S *Prereq 375* Physical chemical nuclear thermal and mechanical properties of metallic ceramic and liquid fuels for nuclear reactors Fuel fabrication Behavior of fission products Fuel restructuring and densification Implications for safety and economics of nuclear reactors

564 Fracture and Fatigue (E M 564 M E 564) See *Engineering Mechanics*

568 Plasticity and Creep of Materials (E M 568) See *Engineering Mechanics*

569 Mechanics of Composite and Combined Materials (Aer E 569 E M 569) See *Engineering Mechanics*

571 Crystal Chemistry of Ceramic Materials (2 0) Cr 2 Arr *Prereq 201* Review of the fundamentals

of bonding in solids Crystal and ligand field theories Crystal systems and symmetry operations Crystal chemistry of oxides and inorganic compounds Crystal structure property relationships

572 Defects in Ceramic Materials (2-0) Cr 2 Arr *Prereq 307 571* Properties of crystals containing point defects such as Frenkel and Schottky defects plus defects created by non stoichiometry and doping Defect concentration property relations

573 Measurements in High Temperature Systems (2-0) Cr 2 Arr *Prereq 360 or Chem 321* Theory limitations and problems of analysis of measurements at elevated temperature Furnaces and techniques for determination of mechanical physical structural and chemical properties of ceramics at elevated temperatures

574 Ultrasonic Nondestructive Measurement Principles (E M 574) See *Engineering Mechanics*

575 Vitreous State (3-0) Cr 3 Arr *Prereq 347 or 360 or Chem 321* Advanced theory of the vitreous state Structure of glasses nucleation theory control of devitrification composition structure property relationships

576 Ceramic Processing (3-0) Cr 3 Arr *Prereq One course in thermodynamics* Introduction to ceramic processing science Powder processing routes characterization of powders Fabrication of ceramics by casting molding and pressing operations Densification by solid or liquid phase sintering hot pressing and hot isostatic pressing Microstructure development

580 Biomaterials (E M 580 B M E 580) See *Engineering Mechanics*

585 Electron Microscopy of Inorganic Materials (2 3) Cr 3 Arr Microstructural and compositional characterization of materials by transmission and scanning electron microscopy Specimen preparation methods

590 Special Topics Cr var *Prereq Permission of instructor*
- A Metallurgy
- B Ceramics

595 Topics in Material Science Cr 1 to 3 each time elected Arr *Prereq Permission of instructor*
- A Electronic Properties of Materials
- B Magnetic Materials
- C Mechanical Properties of Materials
- D Microstructural Studies

599 Creative Component Cr var

Courses for Graduate Students, major or minor

601 Transport in Solids (2-0) Cr 2 Alt S offered 1995 *Prereq 501* Heat and mass transport in solids developed in terms of mathematical concepts Mathematical analysis of applied problems involving heat and mass transport in solid materials Atomistic description of diffusion in solids Stochastic aspects of atomic and ionic diffusion Phenomenological formulation of mass transport with applications to kinetic processes at elevated temperatures Experimental methods employed in solid state diffusion studies

602 Martensitic Phase Transformation and Twinning (2 0) Cr 2 Alt F offered 1994 *Prereq 502* Thermodynamic and crystallographic aspects of martensitic transformations Nucleation of martensite Diffusion related and diffusionless characteristics Matrix algebraic analysis of shear transformations and twinning Phenomenological theories of martensite formation shape change habit plane and orientation relationships Stress assisted martensite formation Shape memory alloys application to heat engines and other devices

605 Dislocation Theory and Applications (2 0) Cr 2 Arr *Prereq 503* Perfect and imperfect dislocations forces on dislocations conservative and non conservative motion of dislocations and pile ups point defect interactions with dislocations dynamic and temperature effects Application of dislocations to deformation of single and polycrystals flow stress and hardening hydrogen embrittlement fatigue and crack initiation creep and diffusionless transformations

612 Alloy Theory (3 0) Cr 3 Alt F offered 1993 *Prereq 512 or Phys 324 or Chem 402* Substitutional solid solution alloys—models of Friedel Hume Rothery Brewer Engel interstitial solid solution alloys compound formation—Miedema s model crystal chemistry approaches and metastable alloys

670 Kinetics of Ceramic Processes (3-0) Cr 3 Arr *Prereq 501 571* Reaction rate theory and concepts of diffusion in ionic materials applied to analysis of important ceramic processes Solid state and gas solid reactions sintering grain growth and polymorphic transformations

690 Advanced Topics in Materials Science Cr var Arr *Prereq Permission of instructor*
- A X ray Scattering from Crystals Computer fee
- B Scanning Transmission Microscopy Materials fee Computer fee
- C Metallurgical Thermodynamics
- D Materials for Fission and Fusion Reactors and Radiation Effects (Nuc E 690D)
- E Solidification

699 Research

Mathematics

Stephen J Willson Chair of Department

Professors Athreya Barnes Cain Colwell Cornette Corones Dahiya Dickson Fink Gautesen Hentzel Johnston Kliemann Levine Lieberman Luecke Maddux Mathews Miller Murdock Peters Pigozzi Rudolph Sacks Smith A Steiner Tesfatsion Tondra Willson Wright

Emeritus Professors Abian Carlson Sanderson Seifert E Steiner Vinograde Weiss

Associate Professors Alexander Bergman Evans Gregorac Heckenbach Heimes Hogben Nelson Poon Rothmayer Smiley Sprague Weerasinghe Wilson

Assistant Professors Ashlock Budreck Canic Davidson Goggin Grayhack Hansen Kegley, Keinert Mather Peake Song Stanley Wagner

Instructor Ringwald

Undergraduate Study

For the undergraduate curriculum in liberal arts and sciences major in mathematics leading to the degree bachelor of science see *Liberal Arts and Sciences Curriculum*

The program in mathematics offers training suitable for students planning to enter secondary school teaching to work in mathematics and computation for industry or government or to continue their studies in graduate school The requirements for an undergraduate major in mathematics are designed so that the student may have opportunity for appropriate specialization to meet one or more of the foregoing objectives and at the same time obtain a thorough introduction to the mathematics underlying all of them

The requirements for an undergraduate major include

(a) Either 175 176 270 371 and 301, or 165 166 265 301 317 and either 266 or 267

(b) At least one of 302 308 314 450 or 471

(c) Either 331 or 365 or 414

(d) At least 12 additional credits chosen from math courses at the 300 level or above

(e) **English proficiency requirement** The department requires a grade of C– or better in English 104 and 105 (or 105H) An upper-level writing requirement that may be met by writing an acceptable undergraduate thesis (Math 491) or by taking at least one of Engl 204 302 305 314 or JI MC 201 A grade of C- or better is required

The department strongly recommends that each student majoring in mathematics include in the program substantial supporting work beyond the minimum general education requirement of the college in one or more areas of application of mathematics such as other mathematical sciences engineering natural science or social science In particular it recommends that each student take Com S 211 212 Phys 221 222 and Stat 341 342 (or Math 304) It also strongly recommends two years of French German or Russian for students contemplating graduate study in mathematics Credits earned in Math 104 105 140 141 142 150 151 160 195 196 cannot be counted toward graduation by mathematics majors

The department offers a minor in mathematics which may be earned by credit in one of the following options Option I Math 175 176 270 371, and 301 Option II Math 165 166 265 301 307 or 317 and 266 or 267

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in mathematics or applied mathematics and minor work to students taking major work in other departments It is also possible to have joint majors with related departments The department also offers work for the degree master of school mathematics This degree is intended for inservice secondary mathematics teachers Teachers desiring to work toward this degree should present undergraduate work in mathematics beyond calculus

Students desiring to do graduate work with a major in this department should present at least 12 semester credits of work in mathematics beyond calculus It is desirable that this include advanced calculus and abstract algebra

The M S degree may be taken either with or without thesis Candidates for the M S and Ph D degrees must pass a written comprehensive examination covering basic graduate work Ability to use two foreign languages (normally chosen from French German and Russian) as effective research tools in the student s area of specialization is required for the Ph D Candidates for the M S M degree write an approved creative component in lieu of a thesis and must pass a comprehensive oral examination over their coursework

Master of science candidates must have one year and doctor of philosophy candidates must have two years of supervised teaching experience These minima are subject to

increase in individual cases upon recommendation of the student s program of study committee and approval of the chair

Open to graduate students for minor credit only 301, 302 304 307 308 314 317 331 365 385 395 414 415 421 426 435, 436 439 450 465 471 473 481 489

Courses Primarily for Undergraduate Students

10 25 30 High School Algebra (4 0) Cr 0 F S SS For students who do not have adequate facility with topics from high school algebra or do not meet the algebra admission requirement All students should initially enroll in Math 10 The course is divided into tracks of one- and two-semester lengths For most students a diagnostic exam will determine which track must be taken while those not meeting the algebra admission requirement must take a two-semester track Students will receive a grade in Math 25 or 30 respectively depending on the level of material covered Satisfactory completion of Math 30 is recommended for students planning to take Math 140 or 151 while Math 25 is sufficient for Math 104 105 150 195 Stat 101 or 105 Students must complete Math 30 to remove a deficiency Topics include signed numbers polynomials rational and radical expressions exponential and logarithmic expressions and equations Offered on a satisfactory fail basis only Developmental math fee

20 High School Geometry (4-0) Cr 0 S SS For students who do not meet the geometry admission requirement Elements of Euclidean geometry including congruence parallel lines circles similar polygons perimeters areas surface areas and volumes Offered on a satisfactory fail basis only Developmental math fee

100 Orientation in Mathematics (1-0) Cr R F For new majors Issues to consider in planning a program of study Sources of general information and perspectives concerning mathematics Discussion of possible areas of study or careers Offered on a satisfactory fail basis only

104 Introduction to Probability and Matrices (3 0) Cr 3 F S *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Permutations combinations probability binomial and multinomial theorems matrices Markov chains expected value Either 104 or 150 may be counted toward graduation but not both

105 Introduction to Mathematical Ideas (3-0) Cr 3 F S *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Topics from mathematics and mathematical applications with emphasis on their nontechnical content

[a]140 Fundamentals of Algebra for Science and Higher Mathematics (4-0) Cr 3 F S SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Coordinate geometry complex numbers quadratic and polynomial equations functions graphing systems of equations exponential and logarithmic functions determinants

[a b]141 Trigonometry (2 0) Cr 2 F S SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry or enrollment in 140 May be taken concurrently with 140* Trigonometric functions and their inverses solving triangles trigonometric equations polar coordinates graphing

[a b]142 Trigonometry and Analytic Geometry (3 0) Cr 3 F S SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry or enrollment in 140 May be taken concurrently with 140* Trigonometric functions and their inverses solving triangles trigonometric equations polar coordinates standard equations of lines and conic sections conics in polar form graphing of rational functions quadric surfaces

150 Discrete Mathematics for Business and Social Sciences (3-0) Cr 3 F S SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Linear equations and inequalities linear programming matrix algebra discrete probability Either 104 or 150 may be counted toward graduation but not both

[c]151 Calculus for Business and Social Sciences (3-0) Cr 3 F S SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry* Differential calculus integral calculus introduction to max min theory for functions of two variables Will not serve as prerequisite for 265 or 266 or 270

[c]160 Calculus for Economics and Biological Sciences (4-0) Cr 4 F S *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of geometry 1 semester of trigonometry or 141 or 142* Analytic geometry differentiation and integration of elementary functions Will not serve as a prerequisite for 265 or 266 or 270

161 Intermediate Analytic Methods in Biology (4-0) Cr 4 S *Prereq 160 or 166 or 176* Modeling growth and population by means of differential equations multivariate analysis matrix and other discrete methods

c [d]165 166 Calculus I II (4-0) Cr 4 each F S SS *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of geometry 1 semester of trigonometry or enrollment in 141 or 142 166 Grade of C– or better in 165* Functions limits and continuity differentiation integration polar coordinates series

c, [d]175 176 Calculus with Differential Equations I, II (5-0) Cr 5 each Yr *Prereq 175 Same as for 165 176 175* Functions limits and continuity differentiation integration applications polar coordinates series introduction to differential equations

[a]195 Mathematics for Elementary Education I (4-0) Cr 4 F S *Prereq Satisfactory performance on placement exam 2 years of high school algebra 1 year of high school geometry enrollment in programs elementary education or child development* Language of sets systems of whole num bers numeration and algorithms for whole numbers topics from number theory geometric concepts

196 Mathematics for Elementary Education II (2-0) Cr 2 S *Prereq 195* Topics in mathematics of current importance to prospective elementary teachers

205 Computer Programming in FORTRAN (Com S 205) See *Computer Science*

215 Numerical Methods and FORTRAN Programming (Com S 215 Aer E 215) See *Computer Science*

252 Topics in Optimization (3 0) Cr 3 F *Prereq 104 or 150 and one of 151 160 165 175* Partial and total derivatives optimization problems including the Lagrange multiplier rule the Kuhn Tucker conditions second order conditions post optimal analysis

[d]265 Elementary Multivariable Calculus (4-0) Cr 4 F S SS *Prereq Grade of C– or better in 166 or 176* Vectors functions of several variables gradients multiple integrals

[d]266 Elementary Differential Equations (3-0) Cr 3 F S SS *Prereq Grade of C– or better in 166 or 176* Elementary theory and applications of ordinary differential equations matrices and solutions of linear equations eigenvalue methods for systems of linear differential equations

[d]267 Elementary Differential Equations and Laplace Transforms (4-0) Cr 4 F S SS *Prereq 265* Same as 266 but also including Laplace transforms and series solutions to ordinary differential equations

268 Laplace Transforms (1-0) Cr 1 F *Prereq 265 266* Laplace transforms and series solutions to ordinary differential equations Together 266 and 268 are the same as 267

[d]270 371 Linear Algebra Multivariable Calculus and Differential Equations (4-0) Cr 4 each Yr *Prereq 270 176 371 270* Study of multivariable calculus based on the use of linear algebra Matrices and vector spaces linear equations eigenvalues partial differentiation line integrals multiple integration Green s theorem differential operators series series solutions of differential equations Laplace transforms systems of differential equations matrix exponentials

290 Special Problems Cr 1 to 3 each time taken H Honors

301 302 Introduction to Abstract Algebra (3-0) Cr 3 each 301 F S 302 S *Prereq 301 166 or 176 and 270 or 307 or 317 302 301*
301 Introduction to the theory of groups and rings
302 Theory of fields abstract vector spaces and linear algebra

304 Introductory Combinatorics (3-0) Cr 3 F *Prereq 166 or 176* Permutations combinations binomial coefficients inclusion exclusion principle discrete probability classical probability Additional topics selected from recurrence relations generating functions random walks and Markov chains

[e]307 Theory of Matrices (3 0) Cr 3 F S SS *Prereq 2 semesters of calculus* The algebra of matrices including vector spaces simultaneous linear equations determinants quadratic forms eigenvalues and diagonalization over the real and complex numbers

308 Application of Linear Algebra to Discrete Optimization (3-0) Cr 3 S *Prereq 270 or 307 or 317* Linear programming and topics chosen from game theory transportation and assignment problems discrete dynamic processes and multiple objective linear programming

314 Graphs and Networks (3-0) Cr 3 S *Prereq 166 or 176* Graphs directed graphs and trees Connectedness Graph colorings Eulerian and Hamiltonian chains Matching and covering Optimization for networks Applications

[e]317 Theory of Linear Algebra (4-0) Cr 4 F S *Prereq 166 or 176* Systems of linear equations determinants vector spaces inner product spaces linear transformations eigenvalues and eigenvectors Emphasis on writing proofs and results

331 Topology (3-0) Cr 3 S *Prereq 270 or 317* Topological properties of metric spaces with emphasis on R^n sequences continuous functions completeness compactness

341 342 Introduction to Theory of Probability and Statistics (Stat 341 342) See *Statistics*

[f]365 Complex Variables with Applications (3-0) Cr 3 F S SS *Prereq 265 or 371* Functions of a complex variable including differentiation integration and series expansions residues evaluation of integrals conformal mapping

[f]385 Introduction to Partial Differential Equations (3-0) Cr 3 F S SS *Prereq 371 or 265 and one of 266 267* Fourier series separation of variable methods Bessel series and Legendre polynomials Introduction to Sturm Liouville theory

[f]395 Intermediate Engineering Mathematics (4 0) Cr 4 F S SS *Prereq 265 and 267 or 371* Complex variables and analytic functions complex integration techniques complex series Fourier series separation of variables in partial differential equations Fourier transforms

414 415 Advanced Calculus (3 0) Cr 3 each 414 F SS 415 S *Prereq 414 270 or 307 or 317 415 414* 414 A careful development of calculus of functions of a real variable limits continuity differentiation integration series 415 Calculus of functions from R^n to R^m linear and topological properties of R_n limits continuity differentiation implicit functions multiple integrals line and surface integrals Stokes theorem

421 Mathematical Logic (3-0) Cr 3 Alt S offered 1994 *Prereq 301 or 307 or 317* Validity consistency provability completeness definability and decision problems for propositional calculus

predicate calculus and generalized mathematical theories

426 Mathematical Methods for the Physical Sciences (3 0) Cr 3 F *Prereq 385* Primarily for first-year graduate students in physics and chemistry (Not a substitute for Math 526-527) Emphasis on techniques needed for quantum mechanics and electrodynamics Fourier integrals complex variables and contour integration ordinary differential equations of hypergeometric type Green s functions Sturm Liouville problems and orthogonal functions boundary value problems for partial differential equations

435 436 Geometry (3-0) Cr 3 each Yr *Prereq 435 270 or 307 or 317 436 435* Euclidean geometry through properties invariant under similarity transformations projective geometry by use of synthetic and analytic methods topics chosen from finite geometry non Euclidean geometry and crystallography

439 Mathematics of Fractals (3-0) Cr 3 S *Prereq 265 or 371 some knowledge of programming* Topology of metric spaces iterated function systems algorithms for generation of fractals fractal dimension Julia sets and the Mandelbrot set applications to chaotic systems

450 Number Theory (3-0) Cr 3 Alt S offered 1995 *Prereq 301* Properties of the integers Diophantine equations prime number distribution and representation problems

465 Advanced Calculus for Applied Mathematics (4-0) Cr 4 F S SS *Prereq 265 or 371* Certain frequently applied mathematical concepts presented with enough theory to promote understanding of applications Calculus of functions of several variables including vector calculus line surface and multiple integrals Stokes theorem divergence theorem infinite series

471 Computational Linear Algebra and Fixed Point Iteration (Com S 471) (3-0) Cr 3 F S SS *Prereq 270 (or 265 and either 266 or 267) knowledge of FORTRAN or PASCAL* Computational error solutions of linear systems least square methods similarity methods for eigenvalues non linear equations fixed point iteration in one and several variables Newton s method in several variables

473 Introduction to Scientific Computation (3-0) Cr 3 F S SS *Prereq 371 (or 265 and either 266 or 267) knowledge of FORTRAN* Use of high quality software to solve systems of linear equations solve nonlinear equations interpolate data integrate functions integrate systems of differential equations optimize functions of one and two variables Emphasis on reasons for success or failure of programs

481 Numerical Solution of Differential Equations and Interpolation (Com S 481) (3 0) Cr 3 F S SS *Prereq 371 (or 265 and either 266 or 267) knowledge of FORTRAN or PASCAL* Orthogonal polynomials least square and spline methods numerical differentiation and integration Euler Taylor Runge Kutta and predictor-corrector methods for solution of systems of ordinary differential equations

489 History of Mathematics (3-0) Cr 3 S *Prereq 6 credits in mathematics at the 300 level or above* History of mathematical ideas found in the undergraduate curriculum Topics and treatment may vary with instructor

490 Independent Study Cr 1 to 3 each time taken *Prereq 301 or 317 6 credits in mathematics No more than 9 credits of Math 490 may be counted toward graduation*
H Honors

491 Undergraduate Thesis Cr 2 or 3 Writing a formal mathematics paper Upon approval by the department the paper will satisfy the departmental advanced English requirement

497 Teaching Secondary School Mathematics (SecEd 497) (3-0) Cr 3 F *Prereq 15 credits in college mathematics* Techniques for teaching secondary mathematics students use of calculators in secondary schools

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[a]Students in the College of Liberal Arts and Sciences may not count Math 140 141 142 or 195 toward Group III of the General Education Requirements

[b]Only one of 141 142 may count toward graduation

[c]Only one of the 165 166 175-176 sequences or 151 or 160 may be counted toward graduation

[d]Both of the sequences 165 166 265 266 or 267 and 175 176 270 371 will prepare a student for further study in 300-400 level mathematics courses The main differences are that the 175 176 270 371 sequence moves at a faster pace introduces differential equations earlier and places more emphasis on the use of linear mathematics Credit for courses from both sequences which contain a large amount of similar material may not count toward graduation

[e]Only one of 307 317 may be counted toward graduation

[f]Only two of 365 385 395 may be counted toward graduation

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

504 505 Abstract Algebra (3-0) Cr 3 each Yr *Prereq 302* Algebraic systems and their morphisms including groups rings modules and fields

507 Numerical Solution of Ordinary Differential Equations (Com S 507) (3-0) Cr 3 F S SS *Prereq 481 or 465 or 415 knowledge of FORTRAN* One step methods for initial value problems one-step methods for systems multistep methods boundary value problems Examples using university computers

508 Numerical Solution of Partial Differential Equations (3-0) Cr 3 S *Prereq 385 and one of 471 and 481* Analysis of error and stability of finite difference methods Hyperbolic systems characteristics conservation laws shocks Applications to heat transfer and fluid mechanics The finite element method Direct and iterative solution of large linear systems

509 Computational Methods of Linear Algebra (Com S 509) (3-0) Cr 3 F *Prereq 270 or 307 or 317 knowledge of FORTRAN* Numerical methods for solving linear systems of equations and linear least squares problems and for computing eigenvalues and eigenvectors of matrices symmetric or not Matrix factorizations iteration methods Analysis of well and ill-conditioning of computational problems and stability of methods Practical computing exercises

510 Linear Algebra (3-0) Cr 3 S SS *Prereq 302 or 307 or 317* Advanced topics in linear algebra including canonical forms inner product spaces bilinear forms tensor products and applications to other branches of mathematics

511 512 Functions of a Single Complex Variable (3 0) Cr 3 each 511 F SS 512 S *Prereq 511 465 or 415 512 511* 511 Theory of analytic functions integration singularities and residue theory infinite products 512 Conformal mappings theory of meromorphic and entire functions analytic continuation

513 Numerical Solution of Integral Equations (3-0) Cr 3 Alt S offered 1994 *Prereq 471 or 509 and a knowledge of FORTRAN* Collocation Galerkin expansion and product integration methods First and second kind integral equations Volterra equations weakly singular integral equations

514 Measure Theory (3-0) Cr 3 F *Prereq 414* Measure and integration construction of measures (Lebesque and Lebesque Stieltjes measures) L^P spaces Hilbert spaces differentiation Radon Nikodym theory product measures finite measure spaces Primarily for statistics students

515 Real Analysis I (3 0) Cr 3 F *Prereq 414* Measure and integration differentiation topology of metric spaces Lp spaces Hilbert spaces

516 Real Analysis II (3-0) Cr 3 S *Prereq 515* Elementary theory of Banach spaces Product integration Fubini s theorem Decomposition of measures differentiation theory Fourier analysis theory of distributions

519 520 Computational Complex Analysis (3 0) Cr 3 each Alt yr offered 1994-95 *Prereq 519 365 385 (415 or 465) 520 519* 519 Formal power series and hypergeometric series integrals polynomials conformal mappings 520 Infinite products Laplace Fourier and Hilbert transforms and applications

521 522 Applied Mathematics (3 0) Cr 3 each 521 F SS 522 S *Prereq 521 365 385 522 521* 521 Solution methods for classical linear partial differential equations Series methods Laplace and Fourier transforms Green s functions and other techniques 522 Asymptotic and perturbation methods asymptotic evaluation of integrals regular and singular perturbation expansions WKB method matched asymptotics and method of multiple scales

526 Mathematics of Quantum Physics (3-0) Cr 3 F *Prereq 365 or 426 385* Linear operators on finite and infinite dimensional vector spaces spectral theory Hilbert spaces Hermitian operators and orthogonal series Green s functions integral equations

527 Mathematics of Complex Physical Systems (3 0) Cr 3 S *Prereq 365 or 426 385* Classical molecular dynamics stochastic modeling and Monte-Carlo techniques random walks and diffusion processes nonlinear dynamics self-organization and pattern formation

528 Special Functions (3 0) Cr 3 S *Prereq 365* A unified treatment of the special functions arising in applied mathematics Topics chosen from gamma and beta functions orthogonal polynomials Legendre and Bessel functions elliptic integrals and other functions of hypergeometric type

531 532 Introduction to Functional Analysis (3 0) Cr 3 each Alt yr offered 1993 94 *Prereq Permission of instructor* Fundamental theory of normed linear spaces and algebras emphasizing aspects that provide a framework for study of boundary-value problems eigenvalue problems harmonic analysis and analytic function theory Hahn Banach theorem Banach-Steinhaus theorem Gelfand representation elementary spectral theory for operators in Hilbert space

534 535 Topology (3-0) Cr 3 each Yr *Prereq Permission of instructor* Introduction to general topology and homotopy theory Emphasizes topics useful in analysis

537 Algebraic Topology (3-0) Cr 3 Alt S offered 1995 *Prereq 331 or 534 301* Foundations of algebraic topology Simplicial complexes Simplicial and singular homology groups

540 Seminar in Mathematics Education (3 0) Cr 3 Offered on a 3-year cycle offered SS 1996 *Prereq Enrollment in the master of school mathematics program or professional studies in education* Research studies in mathematics learning and teaching exemplary practices in mathematics education and current state and national trends in the mathematics curriculum in grades K 12

545 Intermediate Calculus (4-0) Cr 4 Offered on a 3 year cycle offered SS 1995 *Prereq 3 semesters of calculus and enrollment in the master of school mathematics program* A further look at the fundamental theorems of calculus and their applications with emphasis on problem solving

546 Algorithms in Analysis and Their Computer Implementation (2 2) Cr 3 Offered on a 3-year cycle offered SS 1995 *Prereq 3 semesters in calculus or concurrent enrollment in 545 and enrollment in the master of school mathematics program* A study of the algorithms used in solving problems arising in the applications of mathematics

implementation of these algorithms through original or library programs Introduction to PASCAL and the use of microcomputers

547 Discrete Mathematics and Applications (4 0) Cr 4 Offered on a 3 year cycle offered SS 1994 *Prereq Enrollment in the master of school mathematics program* Selected topics from linear algebra linear programming and graph theory applied problems computer implementation of several algorithms

549 Intermediate Geometry (3-0) Cr 3 Offered on a 3-year cycle offered SS 1994 *Prereq 435 or equivalent and enrollment in the master of school mathematics program* A study of geometry with emphasis on metrics the group of isometries the group of similarities and the affine group Specific spaces studied normally include the Euclidean plane the 2 sphere and projective 2-space Emphasis on analytical methods

551 Design Theory and Association Schemes (3 0) Cr 3 F *Prereq 504* Combinatorial designs and Latin squares Construction methods including finite fields Error-correcting codes Adjacency matrices and algebraic combinatorics

552 Enumerative Combinatorics and Ordered Sets (3-0) Cr 3 S *Prereq Permission of instructor* Ordered sets and lattices Generating functions Mobius inversion and other enumerative methods

554 Introduction to Stochastic Processes (Stat 554) (3-0) Cr 3 S *Prereq Stat 542* Markov chains on discrete spaces in discrete and continuous time (random walks Poisson processes birth and death processes) and their long term behavior Elementary introduction to Brownian motion and second order processes Optional topics may include branching processes

555 Theory of Stochastic Processes (Stat 555) (3-0) Cr 3 F *Prereq 514 or 515 Stat 542* Martingales Markov processes on continuous spaces and their qualitative behavior Wiener processes Optional topics may include elementary theory of Ito calculus and diffusions linear stochastic systems advanced topics in branching process

557 558 Ordinary Differential Equations (3-0) Cr 3 each Alt yr offered 1994 95 *Prereq 266 or 267 or 371 270 or 307 or 317 415 or 465* The initial value problem existence and uniqueness theorems linear systems stability and asymptotic behavior of solutions dynamical systems two-point boundary value problems

562 Manifolds Differential Geometry and Dynamical Systems (3-0) Cr 3 S *Prereq 414* Manifolds coordinate systems and transformations vector fields one-parameter groups differential forms Riemannian metrics Applications selected from geometry (covariant differentiation curvature tensors geometry of surfaces) or dynamical systems (flows of diffeomorphisms structural stability hyperbolicity bifurcations)

564 Theory of Groups (3 0) Cr 3 Alt S offered 1995 *Prereq 505* Commutators p-groups nilpotent groups solvable groups permutation groups free groups semidirect products introduction to representation theory

567 Boolean Algebras (3-0) Cr 3 Alt S offered 1995 *Prereq Permission of instructor* Structure of Boolean algebras and their representations Stone spaces and duality Atomicity completeness distributivity operators extensions of homomorphisms Examples and applications from mathematical logic and topology

568 Theory of Rings (3 0) Cr 3 Alt S offered 1994 *Prereq 505* Selected topics from the structure theory for various classes of rings including the theory of radicals and rings with chain conditions

571, 572 Mathematical Logic (3-0) Cr 3 each Alt yr offered 1994 95 *Prereq 421* Algebraic structures in logical systems recursive functions consistency undecidability and incompleteness of axiomatic theories results of Gentzen and Goudel theory of models ultraproducts and ultralimits *nonstandard analysis*

573 Random Signal Analysis and Kalman Filtering (Aer E 573 E E 573 M E 573) (3-0) Cr 3 F *Prereq 341 or 395 or E E 374 or Aer E 431 or M E 360 or 411* Elementary notions of probability Random processes Autocorrelation and spectral functions Estimation of spectrum from finite data Response of linear systems to random inputs Discrete and continuous Kalman filter theory and applications Smoothing and prediction Linearization of nonlinear dynamics

574 Optimal Control (Aer E 574 E E 574 M E 574) (3 0) Cr 3 *Prereq 577* The optimal control problem Variational approach Pontryagin s principle Hamilton-Jacobi equation Dynamic programming Time-optimal minimum fuel minimum energy control systems The regulator problem Structures and properties of optimal controls

576 Digital Feedback Control Systems (Aer E 576 E E 576 M E 576) (3-0) Cr 3 *Prereq 415 or Aer E 431 or E E 475 or M E 411 or 414 and Math 267 or 371* Sampled data discrete data and the z transform Design of digital control systems using transform methods root locus frequency response and direct design methods Design using state-space methods Controllability observability pole placement state estimators Digital filters in control systems Microcomputer implementation of digital filters Finite wordlength effects Linear quadratic optimal control in digital control systems Simulation of digital control systems

577 Modern Control Systems I (Aer E 577 E E 577 M E 577) (3 0) Cr 3 F *Prereq 415 or E E 374 or Aer E 431 or M E 414 and Math 307 or 371* State variable and input-output descriptions of linear continuous time and discrete-time systems Solution of linear dynamical equations Controllability and observability of linear dynamical systems Canonical descriptions of linear equations Irreducible realizations of rational transfer function matrices Canonical form dynamical equations State feedback State estimators Decoupling by state feedback Design of feedback systems Stability of linear dynamical systems

578 Modern Control Systems II (Aer E 578 E E 578 M E 578) (3 0) Cr 3 S *Prereq 577* Well posedness of nonlinear control systems Approximate analysis methods Krylov Boguliubov method Poincaré perturbation method and describing function method Lyapunov stability theory Absolute stability of feedback systems Input-output stability Large scale systems

581 Axiomatic Set Theory (3-0) Cr 3 Alt F offered 1993 *Prereq Permission of instructor* Axiomatic considerations model and proof theory Zermelo-Frænkel axioms classical theorems transfinite methods ordinal and cardinal numbers and their arithmetic Von Neumann Bernays Goudel axioms inaccessible cardinals consistency and independence results of Goudel Cohen and others method of forcing

584 Category Theory (3 0) Cr 3 Alt F offered 1993 *Prereq 302* Categories and functors and their applications

585 586 Partial Differential Equations (3-0) Cr 3 each Alt yr offered 1993 94 *Prereq 415 or 515 or 521* First order equations and systems wave heat and potential equations Huygen s principle fundamental solutions maximum principle variational methods

588 589 General Theory of Algebraic Structures Cr 3 each Alt Yr offered 1993 94 *Prereq 504* Subalgebras homomorphisms congruence relations and direct products Lattices and closure operators Varieties and quasivarieties of algebras free algebras Birkhoff s theorems clones Mal cev conditions Advanced topics

590 Special topics Cr var

599 Creative Component Cr var

Courses for Graduate students, major or minor

610 Seminar

690 Advanced Topics Cr var *Prereq Permission of instructor*

- A Algebra
- B Functional Analysis
- C Measure Theory
- D Approximation Theory
- E Linear Algebra
- F Calculus of Variations
- H Harmonic Analysis
- L Logic and Foundations
- M Complex Analysis
- N Numerical Analysis
- O Ordinary Differential Equations
- P Partial Differential Equations
- S Set Theory
- T Topology
- U Automata Theory
- V Optimization Theory
- W Probability and Stochastic Processes
- Y Special Functions

699 Research

Mechanical Engineering

Theodore H Okiishi Chair of Department

Professors Bahadur Bathie Bernard Colver Cook Danofsky Hall Hendrickson Henkin Junkhan Kavanagh Okiishi Pate Peters Pletcher Shapiro Wechsler Wilson

Emeritus Professors Baumgarten Fellinger Larson Mischke Roberts Serovy Spinrad

Associate Professors Brown Bullen Edelson Flugrad Joensen Maxwell Molian Nelson Prusa Scrutton Van Gerpen Vanderploeg Van Meter

Emeritus Associate Professors Myers

Assistant Professors Bartlett Gassman Gray Jeong Luecke Oliver Vance

Undergraduate Study

For the undergraduate curriculum in mechanical engineering leading to the degree bachelor of science see *College of Engineering Curricula*

Mechanical engineers are intimately involved with the processing distribution and use of energy the processing of material the control and automation of systems of production the development of human-machine systems and the development of vehicles of transport About one-fourth of all engineers practicing today have been *educated as mechanical engineers* Their activities include research development design construction testing production operation sales and technical management

Mechanical engineering undergraduates rely on a broad foundation in mathematics and the fundamental sciences of physics and chemistry This background is extended and organized for application in solid mechanics fluid mechanics thermodynamics heat transfer materials and electrical applications Additional courses in the design of experiments engineering analysis and manufacturing engineering provide the basis for real-problem solutions in design courses Technical electives are provided to give the student choices of additional broad or specialized extensions Organized sequences of technical electives may be chosen from areas which represent the major teaching and research areas in the department Optional areas of specialization are energy conversion and utilization machines and systems materials and manufacturing nuclear

engineering thermal and environmental engineering and vehicle propulsion

A comprehensive sequence of electives in social and humanistic studies is a vital and integral part of the curriculum Students are encouraged to broaden their educational objectives by examining the offerings of all departments of the university and integrating additional studies into their educational plan

The department cooperates with the Department of History in offering courses in the history of technology and science See listings below under *Courses in History of Technology and Science*

The curriculum prepares students to enter established areas of mechanical engineering or to accept interdisciplinary challenges in fields such as environmental protection energy conservation biomedical engineering or other emerging technologies Elective courses provide additional emphasis in terms of the student s educational goals whether they include immediate entry into industry or further study at the graduate level

A five-year cooperative education program is available to students in the department

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with major in mechanical or nuclear engineering (see *Nuclear Engineering*) The master of science degree may be earned with or without thesis Course offerings may be used in co-major or minor programs for students of other departments

The graduate program offers advanced study including design and research in fluid mechanics turbomachinery fluid power controls heat transfer machines and systems materials and manufacturing processes thermodynamics and energy utilization Instrumentation design of experiments and computational methods may be applied to any of these areas

The department participates in the interdepartmental minor program of Technology and Social Change (See *Index*)

The department offers students the opportunity to broaden their education by participating in minor programs in established departments interdepartmental programs or other experiences as approved by their program of study committees

The requirements for advanced degrees are established by the student s program of study committee within established guidelines of the Graduate College Graduate students who have not completed an undergraduate program of study substantially equivalent to that required of undergraduate students in the department can expect that additional supporting coursework will be required A foreign language requirement exists for the degree doctor of philosophy only if the student's program of study committee deems it appropriate to a specific program of study

Open to graduate students for minor credit only All 300 and 400 level courses except 302 330, 397 440 490 and all courses listed under *History of Technology and Science*

Courses Primarily for Undergraduate Students

298, 398 498 Cooperative Education Cr R F S SS *Prereq Permission of department chair 298 sophomore classification 398 junior classification 498 senior classification* Required of all cooperative students Students must register for these courses prior to commencing each work period

302 Mechanical Engineering Seminar (1 0) Cr R S *Prereq Credit or enrollment in 310 321 331* Technical seminar

310 Mechanisms (4-0) Cr 4 F S *Prereq Engr 160 E M 345* Design of mechanisms Kinematic synthesis and analysis of linkages cams gear trains Kinematics and dynamics of machinery Extensive use of computers for computation and graphical display

311 Mechanical Systems (2 2) Cr 3 F S *Prereq 310 Math 267 E E 441* Mechanical systems their equations of motion and dynamic response Fundamentals of industrial automatic control Laboratory experiments and problems

321 Mechanical Behavior of Materials (M S E 321) (2 2) Cr 3 F S *Prereq M S E 201 E M 324* Application of the basic principles of structure of materials to the study and control of mechanical properties Qualitative and quantitative relationships between microstructure and mechanical properties

322 Manufacturing Processes (M S E 322) (2-2) Cr 3 F S *Prereq 321* The relationship between material properties manufacturing processes and product properties The basic processes (casting welding forming and machining) and the functional characteristics of equipment Manufacturing considerations in design Term paper

***330 Thermodynamics** (3-0) Cr 3 F S *Prereq Math 265 Phys 222 For students electing one course in engineering thermodynamics* First and second laws of thermodynamics Properties and processes for pure substances Selected applications including cycles for power and refrigeration Psychrometrics

***331 Engineering Thermodynamics I** (4-0) Cr 4 F S *Prereq Math 265 Phys 222* Fundamental concepts based on zeroth first and second laws of thermodynamics Properties and processes for ideal gases and solid liquid vapor phases of pure substances Vapor and gas power cycle applications

332 Engineering Thermodynamics II (3-0) Cr 3 F S *Prereq 331* Gas tables one-dimensional compressible flow Refrigeration cycles Constant composition gas mixtures Psychrometry and introduction to air conditioning processes Material and energy balances for combustion processes Thermochemistry

335 Fluid Flow (3-0) Cr 3 F S *Prereq 331 E M 345 Math 266 or 267* Incompressible and compressible fluid flow fundamentals Dimensional analysis and similitude Internal and external flow applications

360 Engineering Measurements and Instrumentation (2-3) Cr 3 F S *Prereq 311 Stat 305* Fundamentals of design selection and operation of components of measuring systems Measurement processes data acquisition systems analysis of data and propagation of measurement uncertainty

397 Engineering Internship Cr R F S *Permission of department* Professional work period one semester maximum per academic year

411 Automatic Controls (2-2) Cr 3 F *Prereq 311* Methods and principles of automatic control Pneumatic hydraulic and electrical systems Representative applications of automatic control systems Mathematical analysis of control systems

412 Legal and Environmental Considerations in Design (3-0) Cr 3 F *Prereq Credit or enrollment in 416 senior classification in engineering* Failure modes associated with product environment Interaction between the legal profession legislative bodies standards and the design engineer using a case study approach in design applications Litigation involving designs standards and laws applicable to specific designs surveyed The influence of laws and standards upon design

413 Practical Fluid Power Circuits (A E 413) (0-3) Cr 1 F *Prereq Credit or enrollment in 414 or A E 447* Properties of fluids Pump and motor efficiencies Analysis and assembly of fluid power systems and experimental investigation of appropriate control systems Application to hydrostatic transmissions

414 Hydraulic Systems and Control (3 0) Cr 3 I *Prereq 311 335* Characteristics of hydraulic motors and pumps system components system analysis feedback control and stability control circuits computer simulation

415 Mechanical Systems Design (0-6) Cr 3 F S *Prereq 311 322 416* Solution of a total design problem involving a mechanical system documenting decisions concerning form and function material specification manufacturing methods safety cost and conformance with code, and standards Solution description includes oral and written reports

416 Design of Machine Elements I (3-0) Cr 3 F S *Prereq 310 321 Stat 305* Philosophy of design Failure models useful in fatigue and distortion circumstances Analysis selection and synthesis of machine elements

417 Design of Machine Elements II (3-0) Cr 3 S *Prereq 416* Continuation of 416 involving some additional elements alternative viewpoints and computational considerations Analysis selection synthesis and redesign of machine elements using computer and CAD/CAM assistance

418 Mechanical Considerations in Robotics (3-0) Cr 3 S *Prereq 311* Three dimensional kinematics dynamics and control of robot manipulators hardware elements and sensors Experiments and demonstrations using industrial robots

420 Computer Graphics and Geometric Modeling (3-0) Cr 3 F *Prereq 311 programming experience in FORTRAN or C* Fundamentals of computer graphics technology Parametric curve and surface modeling intrinsic and relational properties interpolation intersection Solid model representations Applications in engineering design analysis and manufacturing

436 Heat Transfer (3-0) Cr 3 F S *Prereq 330 or 331 335 or E M 378 Math 266 or 267* Heat transfer by conduction convection and radiation Similarity and analog concepts in heat mass and momentum transfer Methods for determination of heat transfer coefficients Combined modes of heat transfer Heat exchangers

***440 Principles of Heating and Air Conditioning** (4-0) Cr 4 S *Prereq Phys 222* Basic principles of thermodynamics heat transfer and refrigeration Computation of building heat loss and heat gain Principles of air distribution and duct design

441 Fundamentals of Heating Ventilating and Air Conditioning (3-0) Cr 3 F *Prereq Credit or enrollment in 436* Space conditioning and moist air processes Application of thermodynamics heat transfer and fluid flow principles to the analysis of heating ventilating and air conditioning components and systems Performance and specification of components and systems

***442 Heating and Air Conditioning Design** (1-4) Cr 3 S *Prereq 441* Design criteria and assessment of building environment and energy requirements Design of heating ventilating and air conditioning systems System control and economic analysis Oral and written reports required

444 Elements and Performance of Power Plants (3-0) Cr 3 F *Prereq 332 credit or enrollment in 436* Analysis of power supply systems and their components turbines steam generators fans pumps heat exchangers and air pollution control equipment

445 Internal Combustion Engines (2 2) Cr 3 F *Prereq 332 credit or enrollment in 436* Basic principles thermodynamics and performance of spark ignition and compression ignition engines Engine-drive train vehicle considerations Properties of engine fuels combustion generated air pollutants Laboratory determination of engine performance

446 Power Plant Design (2-3) Cr 3 S *Prereq 444* Design of a power plant to meet a specified power (energy) demand Selection and/or synthesis of principal components and pollution control equipment Oral and written reports required

447 Gas Turbines (3-0) Cr 3 F *Prereq 332 335* General principles thermodynamics and performance of gas turbine engines Engine components engine matching and selection Environmental considerations

448 Fluid Dynamics of Turbomachinery (3 0) Cr 3 S *Prereq 335* Applications of principles of fluid mechanics and thermodynamics in performance analysis and design of turbomachines and related fluid system components

449 Internal Combustion Engine Design (3-0) Cr 3 S *Prereq 322 416 445* Thermodynamic and mechanical design of a spark ignition or compression ignition internal combustion engine to meet specified performance fuel economy and air pollution requirements Oral and written reports required

451 Engineering Acoustics (E M 451) See *Engineering Mechanics*

460 Experimental Engineering (1-3) Cr 2 F S *Prereq 332 360 436 Engl 314* Experimental investigation of selected problems taken primarily from thermodynamics fluid mechanics heat transfer and applied areas of mechanical engineering Emphasis on application of classroom theory to experimental engineering and on interpretation and presentation of the results Oral and written reports required

470 Computer Considerations in Design (3-0) Cr 3 F *Prereq 416 and working knowledge of FORTRAN* Implementing mechanical design using the computer Design strategies thinking as a computer interactive computing Formulating the CAD problem augmenting a CAD capability design examples Student written analysis and design programs

475 Modeling and Simulation (3-0) Cr 3 S *Prereq 311 credit or enrollment in 436* Introduction to computer solution techniques required to simulate flow thermal and mechanical systems Methods of solving ordinary and partial differential equations and systems of algebraic equations interpolation numerical integration finite difference and finite-element methods

490 Independent Study Cr 1 to 6 *Prereq Senior classification* Investigation of topics holding special interest of students and faculty Election of course and topic must be approved in advance by supervising faculty

C Engineering Measurements and Instrumentation
D Heat Transfer
E Fluid Power and Controls
F Machines and Systems
G Materials and Manufacturing Processes
H Honors
J Thermodynamics and Energy Utilization
K Fluid Mechanics
L Turbomachinery

*Credit for only one course in each of the following groups of courses may be applied toward graduation 330 331 440 442 The following courses are for students who are not in the mechanical engineering program 330 440 Credit in these courses will not be counted toward a degree in mechanical engineering

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

511 Advanced Control Design (3-0) Cr 3 S *Prereq 411* Application of control design methods using continuous discrete and frequency-based models Approaches include classical pole assign ment model reference internal model and adaptive control methods Mechanical design projects

515 Advanced Design of Machine Elements (3 0) Cr 3 F *Prereq 416* Experimental empirical and rational methods for analysis and synthesis in the solution of advanced design problems in machine elements Creep and fatigue considerations

516 Kinematic Analysis and Synthesis of Mechanisms (3-0) Cr 3 S *Prereq 310* Analysis and synthesis of mechanisms using graphical analytical and computational methodologies

518 Advanced Dynamics of Machinery (3-0) Cr 3 F *Prereq 311* Dynamic forces in machine members Dynamic response of cam follower systems Rotating and reciprocating machine unbalance Forces transmitted and machinery isolation Computer simulation of dynamic response

520 Material and Manufacturing Considerations in Design (3-0) Cr 3 S *Prereq 322 416* Design and redesign to facilitate cost-effective manufacturing Socio-economic considerations Qualitative and quantitative comparisons of designs Research development and technology transfer The engineer s responsibilities to customer employer and the public

521 Polymers and Composites (M S E 521) (3-0) Cr 3 S *Prereq M S E 201 E M 301 or 324* Physical and mechanical properties of plastics rubbers and their composites Manufacturing processes Effect of processing on properties Designing with plastics Competitiveness with other materials

526 Friction and Wear (3-0) Cr 3 F *Prereq 321* Interaction between sliding surfaces Friction and wear mechanisms Relationship of wear to microstructure and properties Surface treatments for reducing wear Role of friction and wear in bearings brakes tires and deformation processing

529 Lasers and Applications (2 2) Cr 3 F *Prereq 322 credit or enrollment in 332 360 436* Principles and theory of lasers Physics of laser light Functional description of various types of lasers and their components Laser applications in manufacturing electronics measurements chemical and biomedical fields Laboratory exercises and term paper presentations

530 Advanced Thermodynamics (3-0) Cr 3 F *Prereq 332* Fundamentals of thermodynamics from the classical viewpoint with emphasis on the use of the first and second laws for analysis of thermal systems Generalized thermodynamic relationships Introduction to thermodynamics from the microscopic viewpoint

531 Statistical Thermodynamics for Engineers (3-0) Cr 3 Alt S offered 1995 *Prereq 330 or 331* First and second laws of thermodynamics properties of gases liquids and solids from a microscopic viewpoint Introduction to non equilibrium thermodynamics Onsager relationships and determination of transport properties

532 Thermodynamics of Compressible Flow I (3-0) Cr 3 F *Prereq 335* Thermodynamics of internal compressible flow One dimensional steady flow isentropic flow normal shock waves constant area flow with friction and heat transfer Generalized one dimensional flow

533 Thermodynamics of Compressible Flow II (Aer E 533) (3-0) Cr 3 Alt S offered 1994 *Prereq 532 or Aer E 411* Theory of unsteady compressible flow and steady two dimensional supersonic internal flow Compression and expansion waves and wave interactions Applications

536 Advanced Heat Transfer (3-0) Cr 3 S *Prereq 436* Advanced treatment of heat transmission by conduction convection and radiation

538 Advanced Fluid Flow (3-0) Cr 3 F *Prereq Credit or enrollment in 436* Detailed analysis of incompressible/compressible viscous/inviscid laminar/turbulent and developing fluid flows on a particle/point control volume basis

539 Fluidized Bed Processes (Ch E 539) (3 0) Cr 3 F *Prereq 436 or Ch E 357* Mass momentum and energy balances applied to fluidized beds Hydrodynamics of bubbling turbulent and fast fluidized beds Heat and mass transfer Thermal and chemical processes in fluidized beds Applications

540 Solar Energy Thermal Systems (3-0) Cr 3 Alt S offered 1994 *Prereq 436* Application of heat transfer and thermodynamics to the design and analysis of solar energy collectors and systems

542 Advanced Combustion (3-0) Cr 3 Alt S offered 1994 *Prereq 332 or Ch E 381* Thermochemistry and transport theory applied to combustion Gas phase equilibrium Energy balances Reaction kinetics Flame temperatures speed ignition and extinction Premixed and diffusion flames Combustion aerodynamics Mechanisms of air pollution

543 Energy Systems Engineering (2 0) Cr 2 F *Prereq One course in thermodynamics Econ 201 or 206 or I E 304* Potentials and limitations of energy sources Energy conversion utilization and conservation in industrial residential and transportation systems Energy related economic environmental social and political considerations

545 Thermal Systems Optimization (3 0) Cr 3 Alt S offered 1995 *Prereq 436* Modeling thermal equipment and simulating thermal systems Cost estimating and life cycle analysis Second law analysis Optimization techniques for thermal systems

546 547 Computational Fluid Mechanics and Heat Transfer I II (Aer E 546 547) (3-0) Cr 3 each Yr *Prereq 546 credit or enrollment in 538 or Aer E 541 or E M 571 547 546* 546 Introduction to finite difference methods used in modern engineering Solution of example problems in fluid mechanics and heat transfer 547 Application of computational methods to current problems in fluid mechanics and heat transfer

548 Turbomachinery (3-0) Cr 3 Alt F offered 1993 *Prereq 448* Intermediate level study of turbomachines and related fluid system components Aerodynamic and aeromechanical performance and design considerations

549 Vehicle Dynamics (E M 549) (3-0) Cr 3 S *Prereq E M 345 Math 266 or 267* Theory and engineering principles of road and off-road vehicles Analysis and evaluation of performance characteristics handling behavior and ride qualities

551 Signal Processing in Mechanics (E M 551) (2 2) Cr 3 S *Prereq E M 444 or 451 Math 385* Classification and measurement of time dependent phenomena in mechanics Correlation spectral and probabilistic techniques for the analysis of acoustical vibrational and unsteady fluid dynamic phenomena Selected laboratory experiments emphasizing dual channel FFT analyzer applications in mechanics

560 Design of Engineering Experiments (2-3) Cr 3 F *Prereq 360* Use of data acquisition systems Fundamentals of design selection and operation of instrumentation system components Study of complete measurement systems to satisfy the response sensitivity resolution fidelity and confidence limits required by specification of the experiment Techniques for analysis interpretation and presentation of experimental data Uncertainty analysis and propagation of error Statistical inference and statistical testing Acceptance and comparison tests Confidence limits on means variance and regression lines

564 Fracture and Fatigue (E M 564 M S E 564) (3-0) Cr 3 F *Prereq E M 324 and any one of E M 337 E Sci 352 M S E 201 or 271* Materials and mechanics approach to fracture and fatigue Fracture mechanics brittle and ductile fracture fracture and fatigue characteristics Fracture and fatigue tests thermal fracture mechanics and materials designed to avoid fracture and fatigue

573 Random Signal Analysis and Kalman Filtering (Aer E 573 E E 573 Math 573) (3-0) Cr 3 F *Prereq 360 or 411 or E E 374 or Aer E 431 or Math 341 or 395* Elementary notions of probability Random processes Autocorrelation and spectral functions Estimation of spectrum from finite data Response of linear systems to random inputs Discrete and continuous Kalman filter theory and applications Smoothing and prediction Linearization of nonlinear dynamics

574 Optimal Control (Aer E 574 E E 574 Math 574) (3 0) Cr 3 *Prereq 577* The optimal control problem Variational approach Pontryagin s principle Hamilton Jacobi equation Dynamic programming Time-optimal minimum fuel minimum energy control systems The regulator problem Structures and properties of optimal controls

576 Digital Feedback Control Systems (Aer E 576 E E 576 Math 576) (3-0) Cr 3 *Prereq 411 or 414 or Aer E 432 or E E 475 or Math 415 and Math 267 or 371* Sampled data discrete data and the z transform Design of digital control systems using transform methods root locus frequency response and direct design methods Design using state-space methods Controllability observability pole placement state estimators Digital filters in control systems Microcomputer implementation of digital filters Finite wordlength effects Linear quadratic optimal control in digital control systems Simulation of digital control systems

577 Modern Control Systems I (Aer E 577 E E 577 Math 577) (3-0) Cr 3 F *Prereq 414 or E E 374 or Aer E 431 or Math 415 and Math 307 or 371* State variable and input output descriptions of linear continuous time and discrete time systems Solution of linear dynamical equations Controllability and observability of linear dynamical systems Canonical descriptions of linear equations Irreducible realizations of rational transfer function matrices Canonical form dynamical equations State feedback State estimators Decoupling by state feedback Design of feedback systems Stability of linear dynamical systems

578 Modern Control Systems II (Aer E 578 E E 578 Math 578) (3-0) Cr 3 *Prereq 577* Well posedness of nonlinear control systems Approximate analysis methods Krylov Bogoliubov method Poincaré perturbation method and describing function method Lyapunov stability theory Absolute stability of feedback systems Input-output stability Large scale systems

581 Nuclear Reactor Thermal Hydraulic Analysis (Nuc E 581) (3-0) Cr 3 F *Prereq 436 Nuc E 432* Reactor heat generation and removal Water gas and liquid metal heat transfer for nuclear reactors Thermal limits and margins Thermal stresses in reactor components

582 Nuclear Power Systems (Nuc E 582) (3-0) Cr 3 *Prereq 581* Reactor power cycles Engineered safety systems Advanced reactors and passive safety designs

590 Special Topics Cr 1 to 8
- A Experimental Gas Dynamics
- B Fluid Mechanics
- C Heat Transfer
- D Thermodynamics and Energy Utilization
- E Turbomachinery
- F Vehicular Propulsion Systems
- G Advanced Machine Design
- I Automatic Controls
- J Operating and Environmental Considerations in Design
- K Mechanical Behavior of Materials
- L Manufacturing Processes
- M Tribology
- N Sensitivity Methods
- O Engineering Computation
- P Engineering Measurements and Instrumentation
- Q Independent Literature Investigation

599 Creative Component Cr var

Courses for Graduate Students, major or minor

600 Seminar (1-0) Cr R F

630 Nonequilibrium Thermodynamics (3-0) Cr 3 Alt S offered 1994 *Prereq 530 538* Nonequilibrium concepts in thermodynamics with applications in fluid mechanics and heat and mass transfer Onsager relations entropy generation in irreversible processes nonequilibrium states and properties reacting and two-phase flows

632 Particulate Flow (3-0) Cr 3 Alt F offered 1993 *Prereq 436* Concepts in single and multiparticle phenomena particle interactions with fluids other particles and walls equations of multiphase ducted flow Dense packing particle behavior including heat and mass transfer in fixed and fluidized beds

636 Conduction Heat Transfer (3 0) Cr 3 Alt F offered 1994 *Prereq 436* Techniques for analysis of problems involving steady state and transient heat conduction in solids

637 Convection Heat Transfer (3 0) Cr 3 Alt S offered 1995 *Prereq 436* Heat transfer to internal or external forced convection flows under laminar or turbulent conditions Free convection Heat exchanger design considerations including augmentation

638 Radiation Heat Transfer (3-0) Cr 3 Alt F offered 1993 *Prereq 436* Techniques for analysis of radiation in enclosures Radiative properties of surfaces Radiative transfer in participating media Combined modes of transfer Approximate methods of analysis

639 Two-Phase Flow and Heat Transfer (3-0) Cr 3 Alt S offered 1994 *Prereq 436* Hydrodynamics of adiabatic two-phase flow Pool boiling Forced convection boiling and condensation Dynamic behavior of two-phase systems Augmentation of boiling and condensing heat transfer Applications in the power and process industries

643 Advanced Computational Fluid Dynamics (Aer E 643) (3-0) Cr 3 F *Prereq 547* Advanced topics in computational fluid dynamics Potential topics include TVD/TVB/TVM/ENO schemes geometric consistency on 3 D moving grids real gas considerations 3 D shock fitting time accurate algorithms for 3 D unsteady flows on moving grids turbulence modeling grid generation boundary conditions on bodies in dynamic motion or undergoing structural deformation Focus on code development

650 Fluid Mechanics Seminar (Aer E 650) (1-0) Cr 1 each time taken F *Prereq Permission of instructor* Special topics of current research interest to students and staff of departments concerned

651 Advanced Topics in Fluid Mechanics (E M 651) See *Engineering Mechanics*

690 Advanced Topics Cr var Investigation of advanced topics of special interest to graduate students in mechanical engineering Topic areas include those listed for M E 590 and T Reactor Thermal Hydraulics (Nuc E 690T)

699 Research

Courses in History of Technology and Science

280 281 Introduction to the History of Science (Hist 280 281) (3-0) Cr 3 each 280 F 281 S 280 Ideas of nature from Babylonia to the Renaissance 281 Science from the seventeenth-century scientific revolution to Darwin and Einstein

284, 285 Introduction to the History of Technology and Engineering (Hist 284 285) (3-0) Cr 3 each 284 F 285 S 284 Technology in various civilizations including Greece and Rome to medieval Renaissance and early modern Europe 285 Technology in the Western world in the nineteenth and twentieth centuries

362 Engineer in History (Hist 362) (3-0) Cr 3 Offered alternate years * Development of the engineering profession and its place in society with emphasis on the modern period technocracy and technology assessment

387 Technology Science and Society in Modern Europe (Hist 387) (3-0) Cr 3 Offered alternate years * Wilson From the late eighteenth-century beginnings of the industrial revolution in Britain to World War I Examination of scientists and engineers influence on society and of society on them

485 History of Physics and Physical Engineering (Hist 485) (3 0) Cr 3 Offered alternate years * Wilson Interactions between the science of physics and the branches of engineering associated with it from the post-Newtonian era to the age of Einstein

488 History of American Technology (Hist 488) (3-0) Cr 3 Offered alternate years * Cravens Technology in America with emphasis on the industrial revolution and its consequences American invention and its relation to science technology as social response and perception of it as social problem locus of support for process of technological innovation

489 History of American Science (Hist 489) (3-0) Cr 3 Offered alternate years * Cravens Science and its social relationships since the mid nineteenth century interaction of scientific discoveries and the development of society Continuing impact of Darwinism and other scientific theories science and social thought modern medicine and public health science and industry science and agriculture the social sciences government and science science and the consumer the atomic age big science and the environmental dilemma the energy crisis the role of science in a democracy

*Students should consult the *Schedule of Classes* or the department office for up to-date schedule information

Meteorology

For description of courses see *Geological and Atmospheric Sciences*

Microbiology, Immunology and Preventive Medicine

Delbert L Harris Chair of Department

Professors Beran Harris Hill Hoffman Kaeberle Kramer Paul Platt Rosenbusch Ross Roth Thoen

Emeritus Professors Durand Hartman Hogle Jensen Lockhart Packer Pattee Quinn Switzer Williams

Associate Professors Abou-Gabal Andrews, Dickson, Griffith Minion Reynolds Wannemuehler

Assistant Professors Carpenter Cunnick DiSpirito Murano Phillips Will Zimmerman

Instructors Flaming Kinker Kinyon Proescholdt Swenson

The Department of Microbiology Immunology and Preventive Medicine is jointly administered by the College of Agriculture and the College of Veterinary Medicine Instruction is offered in the areas of bacteriology mycology virology immunology epidemiology and public health at the undergraduate and graduate levels Microbiologic immunologic, regulatory and preventive medical aspects of infectious diseases of animals are emphasized in courses for students in the veterinary curriculum

Undergraduate Study

The department offers undergraduate study for the bachelor of science degree with a major in microbiology For the curriculum in microbiology, see *Agriculture Curricula* In this department principal emphasis is placed on understanding microorganisms and their interrelationships with other organisms in nature the application of microbiology in medicine agriculture and industry and the study of fundamental life processes as exemplified by microorganisms Some fields of microbiology especially advanced research may require further training Undergraduate work in the department is designed to provide sound preparation for graduate study

Graduate microbiologists find career opportunities in a wide variety of areas in hospital and clinical laboratories in federal state and local government agencies in research and development in dairy and food processing in the pharmaceutical and fermentation industries

Undergraduate programs for the major in microbiology usually include the following basic courses 202 202L 310 320 402 408 450 and 475 Aspects of these courses emphasize communication skills environmental issues and problem solving Courses in the following areas are required as supporting work biology chemistry biochemistry genetics mathematical disciplines physics speech

Preveterinary preparation may be accomplished through the curriculum major in this department (see *College of Veterinary Medicine Admission Requirements)*

Students majoring in microbiology are eligible to apply for the Cooperative Education Program with the Agricultural Research Service If selected the student will obtain full-time paid work experience at either the National Animal Disease Center the National Veterinary Services Laboratory or the Soil Tilth Laboratory in Ames Other internship opportunities also are available
The department offers a minor in microbiology which may be earned by accumulating a minimum of 15 credits from the departmental offerings excluding 130

Majors in microbiology must take courses in written communication (Engl 104 105) one course in oral communication (Sp Cm 212) and must meet the College of Agriculture English proficiency requirement of C or better in these courses Students must also meet the College of Agriculture requirements for credit in courses in ethics critical thinking and international/multicultural awareness

Graduate Study

Students may study for the doctor of philosophy degree with majors in microbiology veterinary microbiology or immunobiology Within the microbiology major the student may specialize in applied microbiology food microbiology medical microbiology infectious diseases soil microbiology microbial ecology microbial genetics microbial physiology mycology or virology Study in preventive medicine may be pursued as a specialty within the veterinary microbiology major

The department also offers work toward the master of science with majors in microbiology veterinary microbiology immunobiology or preventive medicine A thesis is required for each of the majors except preventive medicine which has a nonthesis option

The graduate programs in microbiology immunology and preventive medicine are available through the cooperative efforts of faculty in the department and faculty members of other departments of the university The latter are allied members of the departmental faculty and contribute to a diversity of opportunities for graduate study The programs are each coordinated by a program committee consisting of faculty members with special interests in the discipline

Prerequisite to graduate study is completion of coursework in general microbiology biology biochemistry mathematical sciences and physics Candidates for the majors in veterinary microbiology or preventive medicine should possess the D V M degree or an undergraduate degree in a biomedical science with emphasis in medical microbiology

Courses are open to students majoring in other departments and may be taken for minor credit Courses open to graduate students for minor credit only 310 320 340 402 402L 419 420 421 and 485

The department also participates in the interdepartmental programs in MCDB (molecular cellular and developmental biology) toxicology and water resources (See *Index*)

Each graduate student must demonstrate proficiency in English composition within two semesters in residence

Courses Primarily for Undergraduate Students

110 Orientation in Microbiology (1-0) Cr R F Orientation to the discipline of microbiology and the curriculum in microbiology Offered on a satisfactory fail basis only

130 Microbiology for the Non Biologist (2-0) Cr 2 S Selected topics in microbiology with emphasis on the relationship of microorganisms to health technology and the environment Not acceptable for major or minor credit in microbiology

202 Introductory Microbiology (3 0) Cr 3 F S SS *Prereq Biol 110 or 201 1 semester of chemistry* The characteristics of microorganisms and their roles in disease in the environment and in industry

202L Introductory Microbiology Laboratory (1 3) Cr 2 F S SS *Prereq Credit or enrollment in 202* Materials fee

310 Pathogenic Microbiology (3 6) Cr 5 F *Prereq 202 202L* Study of pathogenic bacteria and other microorganisms Clinical laboratory techniques for the identification and characterization of pathogens Materials fee

311 Introduction to Parasitology (Zool 311) See *Zoology*

320 Advanced General Bacteriology (3-6) Cr 5 S *Prereq 202 202L a course in organic chemistry* A survey of the procaryotes with emphasis on bacterial physiology cytology and ecology The isolation cultivation and study of bacteria Materials fee

402 Molecular Biology of Bacteria and Their Viruses and Plasmids (3-0) Cr 3 F *Prereq 202 202L Biol 301 or Gen 330* Microbial and bacteriophage genetics emphasis on mutagenesis mechanisms of genetic exchange and analysis plasmid manipulation and an introduction to genetic engineering

402L Laboratory in Molecular Biology of Bacteria (1-6) Cr 3 F *Prereq B B 405 or Gen 330 or Biol 301 or Zool 325 or concurrent enrollment in 402* Laboratory techniques in molecular biology and genetics including mechanisms of genetic exchange genetic engineering and plasmid biology Materials fee

406 Principles of Mycology (Bot 406) See *Botany*

***408 (508 DL) Virology** (3-0) Cr 3 S *Prereq 202* The biology of animal plant and insect viruses

***408L (508L DL) Laboratory in Virology** (0-6) Cr 2 S *Prereq Credit or enrollment in 408* Isolation quantitation and characterization of viruses of eucaryotes Materials fee

419 Foodborne Hazards (FS HN 419) See *Food Science and Human Nutrition*

420 Food Microbiology (FS HN 420) (3 0) Cr 3 F *Prereq 202 202L enrollment in 421 (FS HN 421) recommended* The normal microbial flora of foods microbiological indicators of contamination food biodeterioration food borne infections and intoxications food sanitation and preservation in food safety

421 Food Microbiology Laboratory (FS HN 421) See *Food Science and Human Nutrition*

450 Undergraduate Seminar Cr 1 each time taken F S *Prereq Sp Cm 212* Required of all undergraduate majors in microbiology Offered on a satisfactory fail basis only

***475 (575 DL) Immunology** (3-0) Cr 3 S *Prereq 202 3 credits in biochemistry* An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease

485 Soil Biology (Agron 485) See *Agronomy*

490 Independent Study Cr 1 to 5 F S SS *Prereq A minimum of 6 credit hours of 300-level or above coursework in microbiology permission of instructor A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation* Materials fee
H Honors

495 Internship Cr 1 to 2 F S *Prereq At least 6 credits of 300 level or above coursework in microbiology approval of academic adviser* Participation in the Cooperative Extension Intern Program or an equivalent work experience Written report of activities required Satisfactory fail only

Courses Primarily for Professional Students

380 Veterinary Immunology (3 3) Cr 2 S 8 weeks *Prereq First year classification in veterinary medicine* Structure and function of the immune system in animals

386 Veterinary Microbiology I (3 5) Cr 5 F *Prereq Second year classification in veterinary medicine* Bacteria and fungi of veterinary importance with emphasis on mechanisms of disease production and laboratory diagnostic procedures

387 Veterinary Microbiology II (3 2) Cr 4 S *Prereq Second year classification in veterinary medicine* The nature and ecology of rickettsiae and animal viruses Pathogenesis of viral diseases The role of the immune response in pathogenesis and immunity to viral diseases

388 Public Health (3 0) Cr 3 S *Prereq Second year classification in veterinary medicine* Principles and practice of epidemiology Relationships of animals to human health and well being including zoonotic diseases sanitation of food products of animal origin water safety and handling of animal wastes

389 Clinical Mycology (1 2) Cr 2 F *Prereq Second year classification in veterinary medicine or 310* Fungal pathogens common mycotoxins and the associated diseases in animals and humans with emphasis on clinical laboratory diagnosis

390 Topics in Veterinary History (2 0) Cr 1 S 8 weeks Significant persons noteworthy events and pivotal scientific discoveries in the course of the development and advancement of veterinary medicine from ancient times to the present

403 The Human Animal Bond (1-0) Cr 1 F Prereq *Enrollment in veterinary medicine* Concepts of the human animal bond including history philosophy and effects on individuals and society

409 Infectious Diseases of Captive Wild Animals (1-0) Cr 1 F *Prereq Third year classification in veterinary medicine* Infectious diseases (bacterial viral and mycotic) of non human primates birds ruminants cold-blooded animals marine mammals and carnivores

422 Principles of Epidemiology (3-0) Cr 2 S 8 weeks *Prereq Fourth year classification in veterinary medicine* Disease transmission in animal populations Epidemic investigations Disease surveillance and reporting Epidemiology in herd health Independent study required

436 Infectious Diseases and Preventive Medicine (2-0) Cr 2 F *Prereq Third-year classification in veterinary medicine* History etiology epidemiology laboratory diagnosis regulatory control and preventive medicine aspects of the infectious diseases of animals

437 Infectious Diseases and Preventive Medicine (3-0) Cr 3 S *Prereq Third year classification in veterinary medicine* Continuation of 436

484 Laboratory in Clinical Microbiology Cr 1 F S *Prereq Fourth year classification in veterinary medicine* Application of microbiological and immunological procedures to the diagnosis of infectious and immunologically mediated diseases

486 Laboratory in Public Health Cr 1 F S *Prereq Fourth year classification in veterinary medicine* Laboratory exercises and field trips related to veterinary public health practices

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Ecology of Aquatic and Wetland Microorganisms (Bot 500) See *Botany*

501 Microbial Physiology and Genetics (MCDB 501) (5 0) Cr 5 F *Prereq Courses in microbiology genetics and biochemistry* Advanced topics in microbial physiology bacterial genetics and procaryotic molecular biology

505 Poultry Diseases (2 0 or 2 6) Cr 1 or 2 Alt S offered 1994 alt SS offered 1995 8 weeks *Prereq 386 387 V Pth 342* Avian diseases affecting poultry production Techniques currently utilized for diagnosis of disease

***508 (408 DL) Virology** (MCDB 508) (3-0) Cr 3 S *Prereq 402* The biology of animal plant and insect viruses

***508L (408L DL) Laboratory in Virology** (MCDB 508L) (0-6) Cr 2 S *Prereq Credit or enrollment in 508* Isolation quantitation and characterization of viruses of eucaryotes Materials fee

509 Plant Virology (Pl P 509) See *Plant Pathology*

520 Medical Immunology I (3-0) Cr 3 F *Prereq 202 or 380 and 386 3 credits in biochemistry* Nature of the immune system and its role in health and disease

521 Immunologic Assays (1 3) Cr 2 F *Prereq Credit or classification in 520 or 475 or 575* Principles methods and interpretation of assays as applied to the diagnosis of disease

522 Principles of Epidemiology (3-0) Cr 3 S *Prereq 310 or 380 and 386* Disease transmission in animal and human populations Epidemic investigation Vital statistics and disease reporting

524 Medical Mycology (2 6) Cr 4 Alt S offered 1994 *Prereq 310 or 380 and 386 or Bot 596* Fungi pathogenic for animals and humans and the disease with which they are associated Mechanisms of infection Methods of isolation and identification

526 Advanced Veterinary Virology (3-0) Cr 3 Alt F offered 1993 *Prereq 387 or 408 or 508* Pathogenesis and ecology of viral infections and procedures to diagnose and control viral infections

536 Zoonoses and Environmental Health (3-0) Cr 3 F *Prereq 522* Epidemiology prevention and management of zoonotic diseases Factors influencing transmission and survival of pathogenic microorganisms in the environment Application of environmental control measures

540 Livestock Immungenetics (An S 540) See *Animal Science*

***575 (475 DL) Immunology** (3-0) Cr 3 S *Prereq 202 3 credits in biochemistry* Humoral and cellular immune functions Interactions between cells and factors of the immune system that result in health and disease

576 Laboratory in Immunology (0-6) Cr 2 S *Prereq Credit or enrollment in 520 or 575* Serological and cellular immune assays used in diagnosis of disease and in research Materials fee

585 Soil Microbiology and Biochemistry (Agron 585) See *Agronomy*

586 Medical Bacteriology (4-0) Cr 4 F *Prereq 310* Bacteria associated with diseases of vertebrates including virulence factors and interaction of host responses

586L Medical Bacteriology Laboratory (0-6) Cr 2 F *Prereq 310 credit or enrollment in 586 or 625* Procedures used in isolation and identification of pathogenic bacteria including molecular and genetic techniques used in research

590 Special Topics Cr 1 to 5 each time elected F S SS *Prereq Permission of instructor*

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*See page 119 for information on dual listed (DL) courses

Courses for Graduate Students, major or minor

604 Seminar (1 0) Cr 1 F S SS Satisfactory fail only

608 Molecular Virology (Pl P 608) (3-0) Cr 3 Alt S offered 1994 *Prereq Gen 520 and 387 or 508 or 526* Advanced study of virus host-cell interactions Molecular mechanisms of viral replication and pathogenesis

615 Molecular Immunology (B B 615) See *Biochemistry and Biophysics*

620 Molecular Genetics (Gen 620) See *Genetics*

625 Mechanisms of Bacterial Pathogenesis (4 0) Cr 4 Alt S offered 1995 *Prereq 386 and 520 permission of instructor* Advanced study on virulence mechanisms of bacteria and current knowledge of research on host defenses in the pathogenesis of bacterial infections

626 Advanced Food Microbiology (FS HN 626) See *Food Science and Human Nutrition*

629 Medical Immunology II (4-0) Cr 4 S *Prereq 520 or 575* Current concepts of the role of native and acquired immunity in health and disease

641 642 General Mycology (Bot 641 642) See *Botany*

679 Light Microscopy (Bot 679) See *Botany*

679L Light Microscopy Laboratory (Bot 679L) See *Botany*

680 Scanning Electron Microscopy (Bot 680) See *Botany*

680L Scanning Electron Microscopy Laboratory (Bot 680L) See *Botany*

681 Transmission Electron Microscopy (Bot 681) See *Botany*

681L Transmission Electron Microscopy Laboratory (Bot 681L) See *Botany*

682 X ray Microanalysis (Bot 682) See *Botany*

682L X ray Microanalysis Laboratory (Bot 682L) See *Botany*

685 Advanced Soil Biochemistry (Agron 685) See *Agronomy*

690 Current Topics Cr 1 to 3 each time elected F S SS *Prereq Permission of instructor* Colloquia or advanced study of specific topics in a specialized field

A Microbiology
B Immunology
C Infectious Diseases

698 Seminar in Molecular, Cellular, and Developmental Biology (MCDB 698) See *Molecular Cellular and Developmental Biology*

699 Research

Courses offered at the Gulf Coast Research Laboratory

Written permission of the coordinator for the Gulf Coast Research Laboratory 201 Bessey Hall Iowa State University Ames Iowa 50011 is prerequisite to all courses offered at the Gulf Coast Laboratory Numbers in parentheses beginning with MAR are GCRL numbers

452G (MAR 409) Marine Microbiology Cr 3 SS Offered for undergraduate credit through a cooperative arrangement with Iowa State University *Prereq 8 semester credits in microbiology* A general course designed to introduce the microbiology and advanced biology student to the role of microorganisms in the over all ecology of the oceans and estuaries

452LG (MAR 409L) Marine Microbiology Laboratory Cr 2 SS Accompanies 452G

Military Science

Herbert Strasser Chair of Department

Professor Strasser

Assistant Professors A Johnson
B Johnson Russell Smith

The mission of ROTC is to commission the future leaders of the United States Army Since ROTC produces 70 percent of the Army s Officer Corps our task is one of the most important undertakings in the Army and our country today We seek top quality college students We train these potential leaders assess their abilities challenge them with the highest standards of professionalism and those who successfully complete the program receive a commission as a second lieutenant in the U S Army A commission as an Army officer affords the opportunity to pursue a profession in one or several of the 300 different jobs held by Army officers Students may request to serve as an officer in an Army Reserve or National Guard unit This is an outstanding and well-paying part-time job Regardless of the method of service officers in today s Army can be proud to know that they are doing their share in the defense of the United States of America

The ISU military science program is divided into two segments the basic program and the advanced program The basic program (courses numbered 101-210) is designed primarily for freshmen and sophomores **No military obligation** is incurred by a person participating in the basic program The basic program is designed to be informative and to

acquaint students with the military as a profession The basic program or an allowed substitute is a prerequisite for the advanced program **Financial assistance is available on a competitive basis**

Persons interested in military science should visit the department located in the Armory or call the university see toll-free numbers on page 7

Basic Program

These courses are primarily for freshman and sophomore students and except for veterans and basic training graduates are required for entry into the advanced program No more than 10 credits in 100- and 200-level courses may be applied toward graduation

Advanced Program

These courses are for students who have completed the basic program (or equivalent credit) and are mandatory for potential commissioning Successful completion normally obligates the student to military *service on active or reserve duty* In addition to the advanced program a student (cadet) will be expected to pass the Army Physical Fitness Test (precondition for commissioning) each semester and continually maintain *military appearance standards in both* personal grooming and uniform Physical fitness training is regularly conducted outside of class or laboratory hours Students are expected to attend and participate in these exercise activities *Professional Military* Education (PME) coursework outside of the military science curriculum is also a precondition to commissioning These standards are explained to prospective students as they consider enrollment in the advanced program Uniforms will be worn at least twice weekly The 300-level courses will prepare cadets for advanced camp whereas the 400-level courses will be the final preparation for commissioning as a second lieutenant in the U S Army Students must meet academic alignment criteria before entering the advanced program

Courses Primarily for Undergraduate Students

Basic Program

101 *Introduction to Military Science* (1 0) Cr 1 F SS Opportunities available to U S Army officers Officer branches pay fully funded master degree programs scholarship information and leadership and management techniques

101A *Basic Leadership Laboratory* (0-1) Cr 0 5 F Basic military training related to developing confidence character and leadership The team approach in task and mission accomplishment hands-on training of various military items and equipment Cadet staff organization and functions military reviews and ceremonies close order drill leadership reaction rappelling land navigation patrolling first aid and participation in the Army Physical Fitness Test Locations to include Camp Dodge Holst State Forest Pammel Woods (ISU *campus) and the ISU Armory Full participation will* require students to supply certification of medical eligibility

102 The United States Defense Establishment (1-0) Cr 1 S SS In-depth seminars on critical issues *that an officer in the U S Army will likely encounter* Trends within the Department of Defense to include balance of power fit to win concepts life style programs the Army family support services and the organizations of the branches within the U S Army

102A Basic Leadership Laboratory (0-1) Cr 1 S See description for 101A

201 Principles of Leadership (2-0) Cr 2 F SS Development of leadership skills by evaluation of principles and traits of leadership time management values decision making communicating delegating and counseling Leadership assessment programs role playing skits and films are used to enhance and reinforce the instruction

201A Basic Leadership Laboratory (0-1) Cr 1 F See description for 101A

202 Map Reading and Land Navigation (2 0) Cr 2 S SS Characteristics and features of the earth s land mass and application of methods of conducting navigation on land by use of topographical maps compasses and aerial photographs Military map symbols and their practical application

202A Basic Leadership Laboratory (0 2) Cr 1 S Basic military training related to developing confidence character and leadership The team approach in task and mission accomplishment with specific emphasis on land navigation and orienteering Locations include Camp Dodge Holst State Forest Pammel Woods and the ISU Armory Certification of medical eligibility required for full *participation*

210 Practicum in Basic Military Skills Cr 6 SS *Prereq Permission of the professor of military science* Basic military skills for students with no prior military or ROTC training Involves attendance at the six week *Army ROTC Basic Camp Fort Knox* Kentucky Completion enables students to enroll in the Advanced Course and is taken in lieu of 101 102 200 and 202 Offered on a satisfactory-fail basis only

Advanced Program

301 Methods of Instructing Military Skills (3 0) Cr 3 F *Prereq Completion of the basic program* Development of military writing techniques basic educational psychology oral presentation use of training aids and lesson planning Students prepare presentations incorporating all phases of instruction

301A Advanced Leadership Laboratory (0-2) Cr 1 F *Prereq Completion of the basic program* On the job training and evaluation provided by the ROTC cadre Developing training programs structuring laboratories presenting classes planning various events and accepting responsibility for the leadership labs The swim test Army Physical Fitness Test and the diagnostic map test required of candidates for a commission

302 Small Unit Tactics (3 0) Cr 3 S *Prereq Completion of the basic program* Organization composition and missions of operational elements Principles of offensive and defensive combat operations with emphasis on the attack retrograde patrolling combat intelligence tactical orders and troop leading procedures

302A Advanced Leadership Laboratory (0 2) Cr 1 S *Prereq Completion of the basic program* See description for 301A

310 410 Field Training Exercise (0 2) Cr 1 S *Prereq Completion of the basic program* An annual military exercise that requires approximately 30 hours of planning participation and follow-up plus ROTC cadre evaluation Designed primarily for the advanced ROTC cadets in preparation for being commissioned as officers in the U S Army Actual military conditions are simulated detailed instruction in weapons training and execution of a simulated *Operation Order in accomplishing a specific military* mission Conducted as a weekend exercise at Camp Dodge

401 The Military Team (3-0) Cr 3 F *Prereq Completion of the basic program* Organization and *operational concepts of the military staff military* units administration and logistics and organizational structures within the Army division Combat operations and their various elements with emphasis on planning and coordination

401A Advanced Leadership Laboratory (0 2) Cr 1 F *Prereq Completion of the basic program* See description for 301A

402 Seminar The Professional Officer (3-0) Cr 3 S *Prereq Completion of the basic program* Management leadership and professionalism management tools practices theories and principles leadership principles traits and application and introduction to military justice

402A Advanced Leadership Laboratory (2-0) Cr 1 S *Prereq Completion of the basic program* See description for 301A

490 Independent Study (1-0) Cr 1 each time taken *Prereq Completion of 402 permission of the professor of military science* Investigation of an approved topic Must result in a professional journal worthy paper on ethics current military issues interpersonal communications or leadership development

Mineral Resources

(Interdepartmental Graduate Minor)

Supervisory Committee P G Spry Chair
R C Brown W H Buttermore
N L Dietrich S J Henning C L Kilgour
J W Patterson J M Pitt T D Wheelock
D R Wilder

Minor graduate work is offered in mineral resources under a cooperative arrangement with various departments including Aerospace Engineering and Engineering Mechanics Agricultural and Biosystems Engineering Agronomy Anthropology Chemical Engineering Chemistry Civil and Construction Engineering Community and Regional Planning Economics Forestry Geological and Atmospheric Sciences Industrial and Manufacturing Systems Engineering Landscape Architecture Materials Science and Engineering Mechanical Engineering Physics and Astronomy Political Science and Sociology

Minor work in mineral resources provides an opportunity for graduate students to pursue interests in mining and mineral resources science and engineering on an interdepartmental basis Cooperating *departments offer graduate study and* research opportunities in such areas as mineral processing extractive metallurgy fly ash utilization rock mechanics development of mining equipment geology of coal and ore *deposits characterization of coals fuel* science economics of mining and transportation environmental impact of mining and reclamation of surface-mined land

Students desiring to minor in mineral resources should have completed a minimum of 15 semester credits of undergraduate courses in the natural sciences and mathematics including chemistry (4 credits) and physics (4 credits) For the M S degree the minor will include 6 credits or more of approved courses including Mn Rs 507 and at least one additional mineral resources course For the Ph D degree the minor will include 12 credits or more of approved courses including Mn Rs 507 and at least two additional mineral resources courses The following supporting courses may be included in the minor A E 523 Ch E 515 Chem 576 C E 509 E M 560 Geol 543 582 682 I E 443 and M S E 514 A thesis must also be completed in the student s major field which deals with a coal or mineral resource problem The minor should be developed in

consultation with a member of the Mineral Resources Supervisory Committee who will also serve on the student s program of study committee This member should be from an academic discipline outside the major field A student planning to minor in mineral resources should submit a written request through the executive officer of one of the participating departments to the chair of the supervisory committee This request should list courses and thesis research to be undertaken as well as indicating the member of the supervisory committee who will serve on the student s program of study committee

Courses Primarily for Graduate Students, minor only, open to qualified undergraduates

505 Geology of Mineral Resources (Geol 505) (3 0) Cr 3 Alt F offered 1994 *Prereq Geol 365 or permission of Mineral Resources Supervisory Committee* Review of basic geological principles and processes Survey of the occurrence and origin of major ore deposits and mineral resources

506 Mining Methods and Operations (2-0) Cr 2 Alt S offered 1995 *Prereq 505 or Geol 301 Phys 111 or 221* Techniques for location and evaluation of underground mineral deposits Underground and surface mining methods stability and design of underground openings application of mining equipment systems and application of explosives to mining and construction

507 Mineral Resources Field Trip (Geol 507) Cr 1 S *Prereq Enrollment in mineral resources minor* On site inspection of various coal and ore deposits mining operations and mineral processing plants Offered on a satisfactory fail basis only

508 Mineral Processing Operations (Ch E 508 M S E 508) (3-0) Cr 3 Alt F offered 1993 *Prereq Chem 178 Phys 222 Math 265* Principal unit operations employed in processing and beneficiating metallic ores industrial minerals and coal including comminution particle sizing and classification mineral concentration and particle dewatering Mineral concentration methods include gravity separation froth flotation and magnetic separation

509 Mining Reclamation and Mitigation (L A 509) (3-0) Cr 3 Alt F offered 1994 *Prereq 505 or 506 or Agron 473* Historical and cultural attitudes toward mining and reclamation environmental impacts of mining mining and reclamation planning pre and post mining inventories and legal requirements for mining and reclamation

590 Special Topics in Mineral Resources Cr var *Prereq Permission of instructor* Individual study of mining and mineral resources topics issues or problems

Molecular, Cellular, and Developmental Biology

(Interdepartmental Graduate Major)

Program Executive Officer F Chris Minion

Participating Faculty F Chris Minion Chair R E Andrews A G Atherly, D C Beitz R M Benbow S H Bishop J T Colbert C F Ford S P Ford H J Fromm J R Girton D J Graves R Hamilton P G Haydon E R Henderson H T Horner J Horowitz T S Ingebritsen C D Jacobson J Johansen D D Larson M Lee J E Mayfield W J Miller F C Minion A M Myers B J Nikolau M Nilsen-Hamilton S L Nissen J A Olson P A Peterson R M Robson R F Rosenbusch J A Roth D S Sakaguchi P S Schnable S S Shen M H Spalding J K Stadler M H Stromer M J Taylor R W Thornburg C K Tuggle E S Wurtele

Undergraduate Study

A special program in molecular cellular and developmental biology is not offered for the baccalaureate Undergraduates wishing to prepare for graduate study in molecular cellular and developmental biology should elect courses in biochemistry botany genetics microbiology and zoology mathematics through calculus chemistry through organic and one year of physics Zool 325 or Bot 444 are recommended to qualified undergraduates desiring an introduction to this area

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in molecular cellular and developmental biology in several cooperating departments Agronomy Animal Science Biochemistry and Biophysics Botany Food Science and Human Nutrition Microbiology Immunology and Preventive Medicine, Plant Pathology Veterinary Anatomy Veterinary Physiology and Pharmacology and Zoology and Genetics

Facilities and qualified faculty are available in these departments for conducting fundamental research in the various aspects of molecular cellular and developmental biology Ongoing research projects include molecular and cellular studies of viral prokyaryotic plant and animal systems

Students majoring in molecular cellular and developmental biology will be admitted into MCDB or by a department Students admitted into MCDB will take MCDB 697 in their first two semesters and choose a major professor from the participating faculty and a department by the end of their second semester Students admitted by a department will choose a major professor from the participating faculty in that department All Ph D students take a core curriculum consisting of the following courses one year of biochemistry (B B 404 405 or B B 501 502) molecular genetics (Bot 545 MIPM 501 or Gen 620), cell biology (Zool 528 Bot 529 Gen 621) developmental biology (Bot 512 Gen 530, Zool 534) and seminar in MCDB (MCDB 698) M S students take the above core but may delete either the molecular genetics cell biology or developmental biology complement Additional coursework is selected to meet departmental requirements and to satisfy individual student research interests courses may be chosen from those listed below The foreign language requirement is determined by the student s major department All graduate students are required to teach as part of their training for an advanced degree

Students minoring in molecular cellular and developmental biology at the Ph D level must meet the following requirements one year of biochemistry (B B 404 405 or B B 501 502 one course in each of two of the following three areas molecular genetics (Bot 545 MIPM 501 or Gen 620) cell biology (Zool 528 Bot 529 or Gen 621) developmental biology (Bot 512 Gen 530, or Zool 534) and one semester enrollment in MCDB 698 (seminar in MCDB)

Courses for Graduate Students

501 Microbial Physiology and Genetics (MIPM 501) See *Microbiology Immunology and Preventive Medicine*

508 Vertebrate Virology (MIPM 508) See *Microbiology Immunology and Preventive Medicine*

509 Plant Virology (Pl P 509) See *Plant Pathology Seed and Weed Sciences*

508L Laboratory in Virology (MIPM 508L) See *Microbiology Immunology and Preventive Medicine*

511 Functional Neuroanatomy and Morphology of Neurotransmitter Pathways (V An 511) See *Veterinary Anatomy*

512 Plant Growth Regulation (Bot 512) See *Botany*

520 Genetic Engineering (Gen 520) See *Zoology and Genetics*

528 Cellular Growth and Regulation (Zool 528) See Genetics and *Zoology*

529 Plant Cell Biology (Bot 529) See *Botany*

534 Molecular Development and Differentiation (Zool 534) See *Zoology and Genetics*

545 Plant Molecular Biology (Bot 545) See *Botany*

547 Biological Applications of Microscopy (An S/FS HN 547) See *Animal Science/Food Science and Human Nutrition*

562 Evolutionary Genetics (Gen 562) See *Zoology and Genetics*

590 Special Topics Cr arr

592 Molecular Biology of Plant-Pathogen Interactions (Pl P 592) See *Plant Pathology*

607 Plant Biochemistry (B B 607) See *Biochemistry and Biophysics*

615 Molecular Immunology (B B 615) See *Biochemistry and Biophysics*

620 Advanced Molecular Genetics (Gen 620) See *Zoology and Genetics*

631 Current Topics in Developmental Biology (Zool 631) See *Zoology and Genetics*

632 Cellular Regulation (Zool 632) See *Zoology and Genetics*

645 Hormones and Growth Factors (B B 645) See *Biochemistry and Biophysics*

670 Molecular Biology of Muscle (An S/B B 670) See *Animal Science*

675 Nucleic Acid Structure and Function (B B 675) See *Biochemistry and Biophysics*

679 679L Light Microscopy and Laboratory (Bot 679 679L) See *Botany*

680 680L Scanning Electron Microscopy and Laboratory (Bot 680 680L) See *Botany*

681 681L Transmission Electron Microscopy and Laboratory (Bot 681 681L) See *Botany*

682 682L X-ray Microanalysis and Laboratory (Bot 682 682L) See *Botany*

697 Graduate Research Rotation (0 3 to 0 18) Cr 1 to 6 F S Graduate research projects performed under the supervision of selected faculty members in the molecular cellular and developmental biology program

698 Seminar in Molecular Cellular and Developmental Biology (B B 698 Bot 698 Gen 698 MIPM 698 Zool 698) (2-0) Cr 1 to 2 F S Student and faculty presentations

699 Research

Music

Sue Haug Head of Department

Professors Bleyle Darlington David Messenger Swift White

Emeritus Professors Burkhalter Niemack

Associate Professors Alcorn Bjurstrom Christensen Cichy Haug Molison Newman Prater Schilling Simonson Stuart Work Zeigler

Assistant Professors Larkin Smith

Instructors Davis Seelye

Undergraduate Study

The Department of Music maintains a philosophy of education that draws its goals from the larger purposes of liberal arts education as defined in the statement of mission of the College of Liberal Arts and Sciences

The department seeks to make music an integral part of all students lives so that they may find their places within the continually evolving musical tradition

To this end the department provides a comprehensive education through music including

1 The development of aesthetic sensitivity and the broadening of the aesthetic environment

2 The development of intellectual understanding in music

3 The development of skills performance visual and aural analysis teaching and composition

4 The development of environments which stimulate and encourage creativity

5 The development of verbal and nonverbal communicative abilities

This comprehensive education in music prepares the student for life-long growth in the musical arts and includes activities reflecting the general university commitments to teaching creative and scholarly activities and service

The program of the music department is twofold

1 To provide opportunities for any student to develop an understanding and appreciation of music as part of a liberal education Courses in music literature theory and areas of performance are available to the general student

2 To provide a four-year course of professional studies to students who wish to prepare for careers in teaching performance composition and graduate studies in music or related areas

The Department of Music is an accredited institutional member of the National Association of Schools of Music

The theatre program is administered by the Department of Music (see *Index Theatre Courses*)

Bachelor of Arts—Music Major

For the undergraduate curriculum in Liberal Arts and Sciences, major in music, leading to the degree bachelor of arts see *Liberal Arts and Sciences Curriculum*

Candidates for the degree bachelor of arts with a music major will normally complete 48 credits in the following courses
Required 119 120 219 233, 234 235 236 319 333 334 335 336 383 384 Electives 104 133 265 290 301 324 325 350 351 352 353 354 355 356 360 361 362 364 417 419 430 440 448 472 473, 474 475 490 participation in music ensembles

Bachelor of arts students whose chief professional interest lies in research are encouraged to minor in foreign languages and literatures history literature or philosophy

Minor in Music Candidates for the minor in music will complete 19 credits in music including 6 credits in courses numbered 300 and above taken at ISU with a grade of C or better and
a one of the following 100 or 233 and 234
b one of the following 102 103 104 120
c either
Two consecutive semesters of one of the following 111 112 113 131 141 151 161 171, 181 301
or
Two consecutive semesters of one applied music area (choose from 118 318 127 128 227 228 or 133)

Bachelor of Music

For the undergraduate curriculum in music leading to the degree bachelor of music see *Liberal Arts and Sciences Curriculum*

Candidates for the bachelor of music will complete the following requirements

Cr	
46	General education
0 5	Library
46	Music core
34-35	Music major (Students must select one of the following areas of concentration music education organ piano string instruments composition voice and wind or percussion instrument)

General Requirements

Audition and Placement Requirements To be accepted as a music major the student must demonstrate an appropriate level of performance as well as potential in at least one performing medium In addition a student must satisfactorily complete placement examinations in music theory and keyboard skills which will be administered to all applicants The placement examinations will be given by members of the departmental faculty during summer orientation the week preceding the opening of classes for fall semester or by appointment Students should request these examinations in the Department of Music office before deciding on a major in music

Seminars and Recitals All music majors enrolled for applied music courses will attend a weekly 1-hour seminar in their areas and departmental recitals each semester

Ensemble Requirement All bachelor of music students must register for one ensemble course every semester of residence (except during student teaching) Two semesters must be in a large ensemble six semesters in a large ensemble for music education majors

Continuation Examination To be approved for continuation as a music major on the junior level a student must pass a continuation examination taken normally at the end of the fourth semester Before taking this examination the student must fill out the requisite forms as well as prepare a statement of (1) his/her personal goals (2) a self-assessment of his/her progress thus far and (3) an assessment of what he/she needs/wants to accomplish before graduation

The Continuation Examination is divided into two parts Part A consists of performance before a ContinuationExamination Committee Requirements include the performance of three works representing different periods or styles selected by and studied with the applied teacher a self-prepared piece and sight reading During this part of the examination the student must display acceptable solo ability and performance techniques in at least one of the applied areas A written evaluation will be given each student following his/her performance Following the successful completion of Part A the student will meet with the jury committee and adviser to receive a candid assessment of the student s potential to achieve his/her goals (Part B)

All music majors must demonstrate proficiency in piano as a part of the continuation examination This will normally be done by completing Music 228 or for keyboard majors, by completing Music 219 The student must pass all parts of the continuation examination in order to enroll for Music 319 or 419 Applied Music See the Music Department *Student Handbook for* further information

Graduation Proficiency To be recommended for graduation a music student should demonstrate to the music faculty mature acquaintance with performance styles technique and repertoire All music majors will participate in departmental recitals to the satisfaction of the department Candidates for the bachelor of music degree will present a graduation recital

English proficiency requirement The department requires a grade of C– or better in Engl 104 and 105 (or 105H) and completion of Music 383 or 384 to the department s satisfaction or Engl 204 302 305 or 314

Graduate Study

Courses open for graduate minor credit are 430 440 472 473 474 475

Courses Primarily for Undergraduate Students

100 Fundamentals of Music (1 2) Cr 2 F S SS *Prereq Ability to read elementary musical notation* Notation recognition execution and analysis of scales intervals triads and rhythm key signatures time signatures transposition Intended for non majors

102 Introduction to Music Literature I (3 0) Cr 3 F S SS Expansion of the music listening experiences of the general student through greater awareness of differences in techniques of listening performance media and materials of the art Introduction to the components of music form and historical chronology via listening Student need not be able to perform or read music Open to non majors only

103 Introduction to Music Literature II (3-0) Cr 3 S *Prereq Music 102* Continuation of music listening experiences of the general student through directed listening and discussion-analysis Study of instrumental and vocal compositions for solo chamber and large ensemble media Emphasis on stylistic differences among composers and musical periods Western and non Western Student need not be able to perform or read music Open to non-majors only

104 History of Rock and Roll (3-0) Cr 3 S *Prereq 100 or 102 or 233* Rock and Roll from the mid 1950s through the 1980s focusing on the development of rock styles from its roots in blues folk country and pop Expansion of listening experience through study of song forms instrumentation and the sociopolitical significance of song lyrics Student need not be able to perform or read music

***111 Wind Ensemble** (0 3) Cr 1 each time taken F S *Prereq Open to all students by audition* Empha sis on significant extended compositions for wind and percussion instruments Performances include formal concerts on campus and the annual tour

***112 University Band** (0 2) Cr 1 each time taken S *Prereq Open to all students who have performed on a wind or percussion instrument in high school band or orchestra* Repertoire includes the broad spectrum of band music A concert is presented each spring

***113 Jazz Ensemble** (0 2) Cr 1 each time taken F S *Prereq Open to all students by audition* Designed to explore various styles and trends in contemporary jazz

***114 Marching Band** (0-5) Cr 1 each time taken F *Prereq Open to all students who have performed on a wind or percussion instrument in high school band or orchestra Membership determined by date of band application audition may be required for some instruments* Presentation of pregame and halftime shows at each home and at least one away football game Previous marching band experience not required

115 Symphonic Band (0-3) Cr 1 each time taken F S *Prereq Open to all students by audition* Stresses high quality wind literature Performances include formal concerts on campus

118 318 Applied Music Non-majors (½-0 or 1 0) Cr 1 or 2 each time taken F S SS *Prereq Audition permission of instructor* Applied music for the general student Will not satisfy applied music requirements for music majors See 119 for letter designation for various instruments Fee

119, 219 319 419 Applied Music Majors (½ 2 or 1 2) Cr 1 to 3 each time taken F S SS *Prereq Audition permission of instructor restricted to music majors* Minimum weekly practice of 5 hours per credit is expected Weekly seminar required Fee

A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion
K Harpsichord

120 Introduction to Music Listening (3-0) Cr 3 S *Prereq Music major classification* Directed studies via aural analysis for music majors with emphasis on the materials of music form and aesthetic issues Introduction to style and literature of the major performance media in context of historical chronology Fundamentals of score reading and performance terminology

***121 Men s Glee Club** (0 2) Cr 1 each time taken F S *Prereq Audition and permission of instructor* Reading preparation and performance of standard repertoire for male chorus At least three performances per semester

127 128 Class Study in Piano I (0 2) Cr 1 each F S *Prereq 127 100 or audition and permission of instructor 128 127 or audition and permission of instructor* Beginning keyboard technique repertory and sightreading skills

130 Introduction to Music Theory (0 2) Cr 1 F *Prereq Music placement examination* Designed for students who are enrolled in Music 233 but who show a need for basic aural perceptual skills as demonstrated by performance on a placement test Intensive training in sight singing ear training and related aural skills

***131 Cardinal Keynote Singers** (0-2) Cr 1 each time taken F S *Prereq Two semesters experience in one of the following 141 151 161 171* Small mixed chorus featuring various forms of popular music Performances on and off campus

133 Basic Voice Techniques (0-2) Cr 1 each time taken F S *Prereq Permission of instructor* Class study in voice Techniques of vocal production respiration phonation resonation articulation and performance

***141 University Chorus** (0 3) Cr 1 each time taken F S *Prereq Open to all students by audition* Campus concerts each semester

***146 Summer Band** (0-2) Cr 5 each time taken SS *Prereq Open to all students who have performed on a wind or percussion instrument in band or orchestra* One concert presented in SS

***151 Oratorio Chorus** (0 3) Cr 1 each time taken F S *Prereq Open to all students by audition* Campus concerts each semester some concerts in conjunction with ISU Symphony and occasional performances in conjunction with International Orchestra Festival

***156 Summer Chorus** (0 2) Cr 5 each time taken SS Open to students staff and community

***161 Iowa State Singers** (0-5) Cr 1 each time taken F S *Prereq Open to all students by audition* Campus concerts annual spring tour and occasional performances in conjunction with International Orchestra Festival

***171 Chamber Singers** (0-3) Cr 1 each time taken F S *Prereq Open to all students by audition* Several appearances annually by a select group capable of advanced study performing music suitable to small ensemble Renaissance through modern

***181 Symphony Orchestra** (0-4) Cr 1 each time taken F S *Prereq Open to all students by audition* Reading preparation and performance of standard repertoire Three or four concerts annually plus occasional off-campus appearances

219 Applied Music Majors (See 119)

222 Sight Singing (2 0) Cr 2 Alt S offered 1994 *Prereq Permission of instructor* Acquisition and development of basic sight singing competencies through the use of drills exercises and appropriate selections from music literature Individual and small group instruction

227, 228 Class Study in Piano II (0-2) Cr 1 each F S *Prereq 227 128 or audition and permission of instructor 228 227 or audition and permission of instructor* Intermediate keyboard technique repertory and sightreading skills Introduction to score reading and accompanying at the piano

233 235 Basic Materials of Music (2-0) Cr 2 each Yr *Prereq 233 Placement examination 235 233* Brief review of fundamentals Harmonic melodic and rhythmic materials of the common practice period Application of these materials in analysis and writing Techniques of harmonization and nonharmonic tones

234 236 Basic Aural Theory (1-2) Cr 2 each Yr *Prereq 234 Placement examination 236 234* Application of the harmonic melodic and rhythmic materials of the common practice period in sight singing ear training and keyboard

265 Music in Elementary Education (3-0) Cr 3 F S *Prereq HD FS 226 or Psych 230* Experiencing the fundamentals of music through movement playing instruments singing creating music listening and moving to music Information on lesson planning multicultural music integrating music with other subjects in the elementary classroom and evaluation of musical learning

266 Seminar in Music Education (1-2) Cr 2 F Required for second year majors in music education Historical philosophical and social foundations of music education contemporary curriculum developments general music and performance programs in schools planning and evaluating instruction Required observations in area schools

290 Special Problems Cr var F S SS *Prereq Permission of instructor A through F 12 credits in music approval of department head H approval of department head*

A Education
B Theory
C Composition
D History
E Literature
F Applied Music
H Honors

301 Opera Studio (1-3) Cr 1 to 3 each time taken F S *Prereq Permission of instructor* Interpretation and coaching of selected opera scenes and chamber operas including informal and public presentations

318 Applied Music Nonmajors (See 118)

319 Applied Music Majors *Prereq Successful completion of continuation examination* (See 119)

321 Advanced Ensemble (0-3) Cr 1 each time taken F S *Prereq Advanced proficiency and performing ability permission of director and department head* Performance in ensembles that demand high proficiency Open to a limited number of undergraduate and graduate students

A Voice
B Piano
C Organ
D Strings
E Musica Antiqua
F Woodwinds
G Brass
I Percussion
J Mixed

324 English and Italian Diction for Singing (2 0) Cr 2 Alt F offered 1994 *Prereq Credit or enrollment in 118A or 119A* The international phonetic alphabet and its application to correct pronunciation of English and Italian in singing

325 French and German Diction for Singing (2-0) Cr 2 Alt S offered 1995 *Prereq Credit or enrollment in 118A or 119A* The international phonetic alphabet and its application to correct pronunciation of French and German in singing

333 335 Advanced Materials of Music (2 0) Cr 2 each Yr *Prereq 333 235 335 333* Writing and analysis based on musical styles from the Renaissance through the 20th century Emphasis on the development of chromatic harmony from the Baroque through the Romantic era

334 336 Advanced Aural Theory (1 2) Cr 2 each Yr *Prereq 334 236 336 334* Application of chromatic materials in sight singing ear training and keyboard

350 Instrumental Techniques Strings (0-4) Cr 2 F Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

351 Instrumental Techniques Clarinet, Flute, Saxophone (1 2) Cr 2 S Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

352 Instrumental Techniques Oboe, Bassoon (0-2) Cr 1 F Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

353 Instrumental Techniques Trumpet French Horn (0 2) Cr 1 S Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

354 Instrumental Techniques Trombone Baritone, Tuba (0-2) Cr 1 F Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

355 Instrumental Techniques Percussion (0-2) Cr 1 S Techniques and skills required for teaching of instruments Examination of materials for school use For the instrumental music specialist

360 Vocal Pedagogy (2 0) Cr 2 S *Prereq 319A or vocal proficiency examination* Physical acoustical and musical properties of the vocal instrument including a survey of important texts and articles on singing and voice production

361 Conducting I (1 2) Cr 2 F *Prereq 235 236* Introduction to conducting score reading and analysis Conveying musical ideas through appropriate gestures Leadership role of the conductor

362 Conducting II (1 2) Cr 2 S *Prereq 361*
A Choral techniques Style and interpretation of choral repertoire
B Instrumental techniques Advanced baton technique Score preparation Specific problems of large instrumental ensembles

364 Music in Early Childhood Education (3 1) Cr 3 S *Prereq HD FS 129 or 225* Objectives teaching approaches and materials for guiding musical growth ages 3 to 5 The musical characteristics of children the musical environment and the application of rhythm instruments folk songs and instruments and movement in conceptual teaching and learning Observation of and participation with preschool children

383 384 History of Music (3-0) Cr 3 each Yr *Prereq 383 102 or 120 384 383 recommended* History of the stylistic and cultural development of music 383 Middle Ages through Baroque 384 Classical through contemporary music

417 Literature and Pedagogy in Applied Music Cr 1 to 3 each time taken F S SS *Prereq Permission of instructor*
A Voice
B Piano
C Organ
D Strings
E Carillon
F Woodwinds
G Brass
I Percussion

419 Applied Music Majors (See 119)

430 Seminar in Analysis for Performance (3 0) Cr 3 F *Prereq 335 336* Analysis and performance of selected works appropriate to student s performance medium Examination of structural rhythmic harmonic and textural aspects of the music selected Literature will vary according to the needs of the class

440 Seminar in Music Theory (3-0) Cr 3 S *Prereq 335 336* Various topics in music theory including counterpoint arranging pedagogy and psychology of music Content will vary Contact the Department of Music for the current year offering

448 Electronic Music Synthesis (3 0) Cr 3 F *Prereq 335 336* Introduction to techniques of electronic music production recording mixing Emphasis on applications to music education and creative work

464 Band Administration Materials and Methods (2-0) Cr 2 S *Prereq 362* Administrative techniques and instructional materials appropriate for teaching instrumental music in the elementary and the high school Procedures for directing marching band and jazz band programs in the secondary schools Instrumental rehearsal techniques for the elementary and secondary band and orchestra

465 Choral Materials and Methods (2-0) Cr 2 F *Prereq Credit or enrollment in 466* Instructional materials and methods appropriate for teaching choral music in the secondary school Emphasis on pedagogy and rehearsal techniques

466 Music Education (4 0) Cr 3 F *Prereq 362 admission to teacher education successful completion of continuation exam concurrent enrollment in LAS 480K* Foundations and principles of music education objectives planning curriculum methods traditional and multicultural materials current trends related research Developing a rationale for music education Overview of Kodály Orff and Gordon approaches evaluation of music teaching and learning

472 History of American Music (3-0) Cr 3 Alt F offered 1994 *Prereq 9 credits from music American literature American history art history* Serious and popular currents that have influenced development in American music and its relation to transcendentalism mass culture and other intellectual social and cultural trends in the history of America

473 Music of the Baroque Era (3-0) Cr 3 Alt S offered 1995 *Prereq 383 384* Detailed survey of instrumental vocal choral and keyboard music from 1600 to 1780

474 Music of the Classical Era (3 0) Cr 3 Alt F offered 1993 *Prereq 383 384* Detailed survey of instrumental vocal choral and keyboard music from 1780 to 1825

475 Music of the Romantic Era (3 0) Cr 3 Alt S offered 1994 *Prereq 383 384* Detailed survey of instrumental vocal choral and keyboard music from 1825 to 1910

490 Independent Study Cr var F S SS *Prereq Permission of instructor A through F 12 credits in music approval of department head No more than 9 credits of Music 490 may be counted toward graduation*
A Education
B Theory
C Composition
D History
E Literature
F Applied Music
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

590 Special Topics Cr var F S SS *Prereq Permission of instructor approval of department head*
A Education
B Theory
C Composition
D History
E Literature
F Applied Music

593 Workshops Cr var
A Foundations of Music Learning
B Music in Early Childhood
C Junior High School Music Programs
D Instrumental Teaching Techniques
E Research in Music Education
F Vocal/Choral Teaching Techniques

*Offered on a satisfactory fail basis only

Naval Science

C Doug Ward Chair of Department

Associate Professors Corley

Instructors Gibson Leahy Swehla Van Brocklin

The function of the Navy and Marine Corps officer education programs is to provide by a permanent system of education in essential naval science and other academic subjects at civil education institutions a source from which qualified officers may be available for the Navy and the Marine Corps and their reserve components

Students who enter the Navy and Marine Corps officer education programs may apply for either of two programs the *NROTC scholarship program* (full scholarship which includes books tuition laboratory fees uniform and $100 per month) or the *college program* (nonscholarship limited financial assistance) Applicants for the scholarship program are selected through comprehensive nationwide competitive procedures Applicants for the college program are selected by the professor of naval science from among students already in attendance at or selected for admission by the university This program only involves financial assistance of $1 000 for each of the last two academic years NROTC students pursue their studies like other students except that they meet certain requirements that will prepare them to serve as officers after graduation A scholarship program student incurs a 4-year active duty military obligation as a commissioned officer after graduation a college program student incurs a 3-year active duty obligation If a scholarship student fails to earn a degree or if a commission is not tendered (for other than physical reasons) the student then incurs a 2-year obligation in an enlisted grade This obligation is not incurred during the freshman year Information is available from the professor of naval science Iowa State University

While in the program students will participate in summer at-sea training cruises with pay and will be expected to take part in extracurricular activities that will help them decide which field of the Navy or Marine Corps they wish to enter These activities include three cruises for scholarship and one for nonscholarship students several student societies and indoctrination trips to a naval air station a submarine base and a Marine Corps base

Undergraduate Study

Naval science courses are primarily for those students in the NROTC program However other university students may also enroll in naval science courses

All students enrolled in the NROTC program must fulfill the following requirements

1 N S 111 210 211 212 311 312 411 412 Marine option students will substitute N S 321 322 421 and 422 for the 300 and 400 series listed above

2 All NROTC students must complete one course in American military history or national security policy A computer science course is required of all Navy option students

3 All Navy option scholarship students must successfully complete Math 165, 166 or 175 176 by the end of the sophomore year Phys 221 222 by the end of the junior year

4 In addition to the normal naval science courses all NROTC students are required to participate in laboratory periods that supplement the various academic courses emphasize human relations principles, teach basic military formations movements commands courtesies and honors, and provide practice in unit leadership

5 NROTC students are not required to major in naval science Navy option scholarship students are encouraged to major in engineering and physical sciences to meet the technological requirements of the modern navy Navy option students and Marine Corps option students may pursue any major leading to a bachelor s degree

Students may major in naval science leading to the degree bachelor of science In addition to completing the required naval science courses students majoring in naval science must take the following courses Chem 163 163L 164 Com S 207 208 Geog 3 credits Hist 389 390 Math 165 166 (175 176) Phys 221 222 Pol S 251 358 457 Psych 101 450 Econ 201 or 205

The College of Liberal Arts and Sciences offers a minor in naval science Requirements for the minor are a minimum of 20 hours and are N S 111 210 211 212 311 or 321 312 or 322 411 or 421 and 412 or 422 The minor must include at least 6 credits in courses numbered 300 or above taken at Iowa State University with a C or better

English proficiency requirement The department requires a research paper and an oral presentation in N S 311 or 412 (Navy option) or N S 321 and 421 (Marine option)

For basic undergraduate curriculum requirements see *Liberal Arts and Sciences Curriculum* or *Engineering Curricula*

Courses Primarily for Undergraduate Students

111 Introduction to Naval Science (3 2) Cr 3 F Introduction to the organization regulations and capabilities of the Navy with emphasis on mission and principal warfare components Course also covers seamanship shiphandling and human resource management

210 Naval Ship Systems I (Engineering) (3 2) Cr 3 F Familiarization with types structure and purpose of naval ships Ship construction stability and damage control ship propulsion and power systems

211 Naval Ship Systems II (3 2) Cr 3 S Introduction to the theory and principles of operation of naval weapon systems Includes coverage of types of weapons and fire control systems capabilities and limitations theory of target acquisition identification and tracking basics of Naval Ordnance

212 Seapower and Maritime Affairs (3-2) Cr 3 S Development of concept of seapower including the Merchant Marine role of various warfare components of the Navy in supporting the Navy s mission implementation of seapower as an instrument of national policy a comparative study of U S and Soviet naval strategies

311 312 Navigation and Naval Operations (3-2) Cr 3 each 311 F 312 S 311 Study of ship navigation movement and work math analysis spherical triangulation and practical work including piloting celestial and electronic navigation environmental factors affecting ship operations 312 Rules of the road and their application to effect safe ship navigation relative motion analysis and maneuvering of tactical formations shipboard organization seamanship naval communications command and control

321 Evolution of Warfare (3-2) Cr 4 Alt F offered 1993 Evolution of warfare from 3500 B C to contemporary times analysis of the impact of historical precedents on modern military thought and action emphasis on the historical development of military tactics strategy and technology

322 Naval Science Laboratory (0-2) Cr R Alt S offered 1994 Open only to NROTC Marine Option Midshipmen

411 Leadership and Management I (3 2) Cr 3 F *Prereq Junior classification* Experiential approach to learning the principles of leadership and management by examining business management theories and their applications Skills are developed in the areas of communication counseling control direction management and leadership through active guided participation Computer fee

412 Leadership and Management II (3-2) Cr 3 S Basic background concerning the duties and responsibilities of the junior naval officer and division officer in the areas of human resources management personnel management material management and the administration of discipline Preparation for responsibilities encountered immediately upon commissioning

421 Evolution of United States Amphibious Warfare (3 2) Cr 4 Alt F offered 1994 Defines the concept of amphibious operations origins traces its development from 600 B C

422 Naval Science Laboratory (0-2) Cr R Alt S offered 1995 Open only to NROTC Marine Option Midshipmen

490 Independent Study Cr 1 to 3 each time taken *Prereq Senior classification 6 credits in naval science No more than 9 credits of N S 490 may be counted toward graduation*

Neuroscience

(Interdepartmental Graduate Program)

Supervisory Committee S S Jeftinija Chair L Anderson C D Jacobson P G Haydon D L Hopper D S Sakaguchi

Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in neuroscience in cooperation with the departments of Animal Science Biochemistry and Biophysics Computer Science Mathematics Microbiology Immunology and Preventive Medicine Psychology Veterinary Anatomy Veterinary Clinical Science Veterinary Pathology Veterinary Physiology and Pharmacology and Zoology and Genetics

Facilities and faculty are committed to research in the following areas neuronal membrane functions signal transduction neuroanatomy neuroendocrinology neurotoxicology neuropathology developmental neurobiology neurogenetics, and behavioral neuroscience

An undergraduate or advanced degree in the sciences is ordinarily a prerequisite for admission to the program A student majoring in neuroscience will select a major professor from the faculty participating in the program

All students take a core curriculum consisting of Neuro 556 557 660, 690 696 B B 404 and Stat 401 All students are also expected to take elective neuroscience courses from the following B M E 545 Psych 511 517 V An 507 511, V Pth 555 VPP 531 551 551L 565 667 668

Courses for Graduate Students

556 Neurobiology (Zool 556) (3-0) Cr 3 F *Prereq Zool 355 or Psych 311 physics recommended* Integration coding plasticity and development in nervous systems

557 Advanced Neuroscience Techniques (Zool 557) (0-6) Cr 2 S *Prereq 556* Research methods and techniques exercises and/or demonstrations representing individual faculty specialties

660 Current Topics in Neurobiology and Behavior (Zool 660) Cr 2 to 3 each time taken *Prereq Permission of instructor* Topics may include communication hormones and behavior neural integration developmental neurobiology neuroanatomy and ultrastructure sensory biology social behavior techniques in neurobiology and behavior

690 Journal Club in Neuroscience (1 0) Cr 1 each time taken F S *Prereq 556* Students are required to attend and make at least one presentation at a weekly journal club focusing on current topics

696 Neuroscience Seminar (1 0) Cr 1 each time taken F S *Prereq 556* Presentations and discussion of research by students faculty and visiting scholars

699 Research

Nuclear Engineering

(Administered by the Department of Mechanical Engineering)

Professors Danofsky, Hendrickson Wechsler

Emeritus Professors Roberts Spinrad

Associate Professors Bullen Edelson

Assistant Professors Bartlett, Gray

Nuclear engineering is that branch of engineering associated with the release control and utilization of all types of energy from nuclear sources Nuclear engineers are responsible for research development design construction operation and management of systems for the controlled release of nuclear energy and the applications of radiation for medical agricultural and industrial use

Industry government and universities employ nuclear engineers in areas such as reactor analysis radioisotope applications computer applications energy transfer radiation protection safety analysis materials selection and development and instrumentation and control Work may involve economics legal processes regulation and inspection construction manufacturing and sales and management

Undergraduate Study

The nuclear engineering program offers only graduate degrees However students in mechanical engineering materials science and engineering physics and other cooperating undergraduate curricula may participate in an area of specialization in nuclear engineering by including the courses 375, 411 432 and 463 as technical electives

Graduate Study

The nuclear engineering program offers work for the master of science (thesis or

nonthesis) and doctor of philosophy degrees with a major in nuclear engineering Minor work in nuclear engineering is offered to students taking major work in other programs

Students may prepare for graduate work in nuclear engineering by pursuing undergraduate programs in engineering or in the physical sciences It is recommended that students contemplating graduate studies in nuclear engineering include courses in the following areas as preparation for graduate work fluid mechanics heat transfer thermodynamics materials science mathematics (beyond differential equations) electronics and instrumentation modern physics and physical chemistry A student entering the program should have preparation equivalent to 411 432 and 463

For the master s program a student must complete certain core courses and electives as recommended by the student s program of study committee

The program participates in the interdepartmental minor programs of mineral resources and technology and social change (See *Index*)

Open to graduate students for minor credit only 375 411 432 463

Courses Primarily for Undergraduate Students

375 Nuclear Materials and Radiation Effects (M S E 375) (3-0) Cr 3 F *Prereq M S E 201 or 271* Survey of materials for fission and fusion reactors Current materials topics in nuclear technology Nuclear fuel and fuel cladding materials Pressure vessels for light water reactors Steam generators Fusion reactor first wall Defects in solids Radiation damage to materials

411 Nuclear Radiation Theory and Engineering (3-0) Cr 3 F *Prereq Phys 222 Math 266 or 267* Atomic and nuclear physics Radioactivity and reaction rates Cross sections Introduction to neutron diffusion theory Engineering applications of radiation theory

432 Nuclear Reactor Theory and Engineering (3 0) Cr 3 S *Prereq 411* Neutron diffusion theory Reactivity coefficients Reactor kinetics Reactor engineering and energy removal Radiation protection and shielding Reactor safety Nuclear power plant licensing and environmental considerations

463 Radiation Measurements and Reactor Laboratory (2-2) Cr 3 S *Prereq 411 or Phys 322* Principles of nuclear radiation measurements Counting statistics and error analysis Analysis of low activity radionuclides in samples of air food water and soil Reactor startup and approach to critical Measurements of reactor parameters Evaluation of reactor safety systems

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

521 Nuclear Physics for Engineers (3 0) Cr 3 F *Prereq 411* Nuclear masses and binding energies Nuclear levels Alpha beta and gamma radioactivity electron capture and internal conversion Radioactive series The fission process Fission neutron production and spectrum fission product yields and decay power Kinetics of nuclear reactions Neutron cross sections and resonances

531 Nuclear Reactor Theory (3-0) Cr 3 S *Prereq 432 521 Math 385* Neutron moderation and diffusion Introduction to perturbation and transport theories Reactor kinetics and control Fuel depletion and fission product poisoning

532 Nuclear Reactor Analysis (3 0) Cr 3 *Prereq 531* Application of diffusion and transport theories to reactor analysis Analysis of radiation shield systems Monte Carlo techniques

533 Computational Methods in Reactor Analysis (3-0) Cr 3 *Prereq 531 Math 481* Numerical analysis in diffusion and transport theories Interactive techniques for solving finite difference equations Finite element techniques Nodal techniques Use of computational modules in design

541 Safety and Control of Nuclear Systems (3-0) Cr 3 S *Prereq 432* Nuclear reactor dynamics and control Safety analysis Assessment of magnitudes and consequences of nuclear incidents Reactor siting containment and engineered safeguards Risk assessment techniques

544 Nuclear Reactor Dynamics (3-0) Cr 3 *Prereq 531* Development of time-dependent nuclear reactor models space independent kinetic equations reactivity feedback and linear system stability Nuclear power plant dynamics

551 Nuclear Reactor Materials and Radiation Effects (M S E 551) (3 0) Cr 3 F *Prereq 375* Radiation flux and spectrum and cross section Defects in materials Theory of collisions and displacement production Experimental observation of radiation damage Defect clusters voids and bubbles Radiation hardening and embrittlement Current materials issues in fission and fusion reactor technology

553 Nuclear Reactor Fuel Materials (M S E 553) (2-0) Cr 2 *Prereq 375* Physical chemical nuclear thermal and mechanical properties of metallic ceramic and liquid fuels for nuclear reactors Fuel fabrication Behavior of fission products Fuel restructuring and densification Implications for safety and economics of nuclear reactors

555 Nuclear Fuel Cycles (3 0) Cr 3 *Prereq 432 Chem 167* The nuclear fuel cycle Uranium occurrence recovery and enrichment Fuel fabrication and irradiation Spent fuel storage transportation reprocessing Preparation of radioactive wastes Monitored retrievable storage of spent fuel and high level waste Economic and risk analysis Nuclear safeguards and nonproliferation impact

563 Advanced Nuclear Engineering Laboratory (0-3) Cr 1 or (0 6) Cr 2 each time taken *Prereq 463* Experiments in radiation detection reactor physics and reactor engineering

571 Fusion Reactor Systems (3-0) Cr 3 *Prereq 432* Principles of thermonuclear fusion cross sections fusion reactions fuel cycles plasma production magnetic and inertial (laser) confinement and heating

581 Nuclear Reactor Thermal Hydraulic Analysis (M E 581) (3-0) Cr 3 F *Prereq 432 M E 436* Reactor heat generation and removal Water gas and liquid metal heat transfer for nuclear reactors Thermal limits and margins Thermal stresses in reactor components

582 Nuclear Power Systems (M E 582) (3-0) Cr 3 *Prereq 581* Reactor power cycles Engineered safety systems Advanced reactors and passive safety designs

584 Radiation Protection Engineering (3 0) Cr 3 *Prereq 432* Radiation dosimetry and shielding Radiation protection regulations and standards Applications of radiation in the medical agricultural and chemical industries

590 Special Topics Cr var Topics of special interest in nuclear engineering

599 Creative Component Cr var Special project for master of science (nonthesis) degree

Courses for Graduate Students, major or minor

690 Advanced Topics Cr var
- A Reactor Theory and Fuel Management
- B Transport Theory and Computational Analysis
- C Reactor Dynamics and Safety
- D Materials for Reactors and Radiation Effects (M S E 690D)
- T Reactor Thermal Hydraulics (M E 690T)

691 692 Graduate Seminar (1-0) Cr R Yr

699 Research

Officer Education Programs

Iowa State University offers Reserve Officer Training Corps (ROTC) programs for the professional training of officers for the Army Air Force Navy and Marines

The purpose of these programs is to provide an avenue for interested students to become reserve or regular officers in one of the United States military services and the university regards this training as the foundation for possible careers in the military The Air Force and the Navy require a period of active duty service upon completion of the ROTC program

All students enrolled in *advanced* ROTC programs receive financial allowances which are described under *Financial Aids* Scholarships are also available for all services as outlined in the section on financial aid

For specific courses and programs see also *Air Force Aerospace Studies Military Science* and *Naval Science*

Pest Management

(Interdepartmental Undergraduate Program)

Advisory Committee Jon Tollefson Chair P Domoto H McNabb B Pearce J Pease L Pedigo

The pest management program is designed for students with a career interest in the science and technology of pest management Students in the program conduct interdisciplinary studies with plant diseases insects weeds and other pests emphasizing the development of management systems that are ecologically and economically sound as well as sustainable The interdisciplinary nature of the program is reflected in the departmental sponsors—Agronomy Animal Ecology Plant Pathology Entomology Forestry and Horticulture

Pest management is an undergraduate secondary major that may be taken only in conjunction with a primary major For example the student may wish to take a primary major in agronomy forestry entomology or some other life science and use elective credits to satisfy the requirements of the pest management major Students educated in pest management may find employment opportunities with governmental agencies (state and federal) agricultural chemical companies food-processing firms consulting agencies urban pest control companies timber companies and other concerns that produce process and market the nation s food and fiber

Students wishing to enroll in the pest management curriculum must register with the chair of the advisory committee After consultation with the chair a pest management adviser will be assigned depending on the interests of the student

The student should indicate interest in pest management as early as possible in order that requirements of the program be effectively integrated with those of the primary major

A pest management minor may be earned by completion of at least 15 credits of pest management or related courses taken at ISU The courses that must be taken for a minor are Agron 317 Ent 376 PL P 407 The remainder of the 15 credits are to be selected from the following Agron 340 Ent 374 PL P 416 P M 491 499 Courses required in a student s major may not be applied toward the pest management minor Contact the pest management chair for more details

Courses Primarily for Undergraduate Students

317 Principles of Weed Science (Agron 317) See *Agronomy*

340 Chemical Use in Crop Production (Agron 340) See *Agronomy*

376 Fundamentals of Entomology and Pest Management (Ent 376) See *Entomology*

407 Principles of Plant Pathology (PL P 407) See *Plant Pathology*

416 Forest Pest Management (PL P 416) See *Plant Pathology*

490 Independent Study Cr 1 to 3 *Prereq Junior or senior classification 3 credits in pest management permission of instructor and written plan of study approved by pest management curriculum chair A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation*

491 Pest Management Experience Cr 2 *Prereq 6 credits in pest management permission of instructor* Practical experience (internship) in management of plant diseases insect populations weeds and other pests Diagnosis problem assessment and control procedures are emphasized For majors and advanced students

499 Pest Management Seminar Cr 1 F *Prereq Senior classification* Current topics of interest to pest management

Philosophy

William S Robinson Chair of Department

Professors Klemke Kupfer Robinson Smith VanIten Wilson

Associate Professors Hollinger Holmgren Roochnik

Assistant Professor Bishop

Undergraduate Study

See *Liberal Arts and Sciences, Curriculum* for the undergraduate curriculum in liberal arts and sciences with major in philosophy leading to the degree bachelor of arts

The major in philosophy offers study in the important ideas values and ways of thinking that underlie cultural social and political processes and that direct the specialized search for knowledge Philosophical study broadens the student s educational experience and facilitates more effective participation in the human community

An undergraduate major in philosophy should have a broad background in the liberal arts and sciences The major program includes both a core and electives to provide a thorough acquaintance with the history of philosophy and further concentration in historical and systematic issues An undergraduate major in philosophy can prepare the student for graduate work in philosophy and also for further study in law history theology religion political science social and political theory or literature

The degree program in philosophy requires a minimum of 27 credits in the core program and 6 credits of electives chosen from the remaining courses listed in the 300 or 400 levels

The following courses compose the basic core program of the department from which 27 credits shall be chosen

a Introduction 201 (required)

b Logic 207 (required)

c Ethical theory one course required Choose from 330 335

d Applied ethics one course required Choose from 230 331 333 442

e History Three courses required at least one each from group A and group B A 310 314 315 B 316 317 318

f Two 400-level courses required

The department offers a minor in philosophy which may be earned by completing a total of 15 credits in philosophy including 201 and at least 6 credits in courses numbered 300 or above Students may want to emphasize specific areas by taking 15 hours of courses chosen from the following

Philosophy of Science 201 206 or 207 314 315 380 381 480
History of Philosophy 201 310 314 315 316 317 318 460 or 470
Social Values and Policy 230 331 332 333 335 430 442

English proficiency requirement The department requires a grade of C+ or better in Engl 104 and 105 (or 105H) and approval of writing by instructor of one history of philosophy course (310-318) to be designated by the student

Graduate Study

The department offers a graduate minor in philosophy For those taking the M A or M S the minor requirement is two courses above 300 (but not 490) taken in conjunction with 590 For those taking the Ph D the requirement is four courses above 300 at least one of which is above 400 (but not 490) all taken in conjunction with 590 Interested students should ask the chair to assign a minor adviser

The department participates in the interdepartmental program in general graduate studies and in the interdepartmental minor in technology and social change (See *Index*)

Courses open to graduate students for minor credit only All courses numbered above 300 except 490

Courses Primarily for Undergraduate Students

201 Introduction to Philosophy (3-0) Cr 3 F S SS It has been rumored that the unexamined life is not worth living Philosophy is an attempt to begin examining life by considering such questions as What makes us human? What is the world ultimately like? How should we relate to other people? Is there a god? How can we *know* anything about these questions? Understanding these kinds of questions and proposed answers to them is what this course is all about

206 Introduction to Logic and Scientific Reasoning (3-0) Cr 3 F S SS Basic principles of critical reasoning and argument evaluation A consideration of basic forms of argumentation in science and everyday life Application to contemporary issues and controversies This course is not recommended for students majoring in math science or engineering

207 Introduction to Symbolic Logic (Ling 207) (3-0) Cr 3 S Introduction to fundamental logical concepts and logical symbolism Development of natural deduction through first order predicate logic with identity Applications to arguments in ordinary English and to philosophical issues Majors should take 207 as early as possible

230 Contemporary Moral Issues (3-0) Cr 3 F S SS Investigation of moral issues in the context of major ethical theories of value and obligation e g punishment abortion economic justice job discrimination world hunger and sexual morality Emphasis on critical reasoning and argument analysis

310 Ancient Philosophy (Cl St 310) (3 0) Cr 3 F *Prereq 201* Survey of the principal philosophers of the ancient world the pre Socratics Plato Aristotle the Stoics and the Epicureans Questions concerning being knowledge language and the good life are treated in depth

314 17th Century Philosophy (3-0) Cr 3 Alt S offered 1994 *Prereq 201* Readings from philosophers such as Hobbes Descartes Spinoza Leibniz and Locke Changing conceptions of knowledge self and deities in response to Galileo s new science and post reformation challenge to ecclesiastical authority

315 18th Century Philosophy (3-0) Cr 3 Alt S offered 1995 *Prereq 201* Readings from philosophers such as Berkeley Hume and Kant Development of Enlightenment thought Issues include idealism causation freedom and knowledge regarding science ethics and deities

316 19th Century Continental Philosophy (3-0) Cr 3 Alt F offered 1993 *Prereq 201* The thought of Hegel Marx Nietzsche and their contemporaries Various perspectives on the philosophy of history the nature of reason and subjectivity the contrast between dialectical and nondialectical philosophy and the relationship between philosophy and society

317 20th Century Continental Philosophy (3-0) Cr 3 Alt F offered 1994 *Prereq 201* An examination of 20th century continental philosophy against the background of the 19th century continental tradition Movements covered include Phenomenology Marxism Postmodernism Post structuralism Feminism Focus on attempts to develop history society and politics debates about the crisis of reason and culture political issues surrounding such debates

318 20th Century Anglo American Philosophy (3-0) Cr 3 S *Prereq 201* Main problems and themes of major movements in contemporary philosophy such as pragmatism realism common sense philosophy logical positivism and ordinary language philosophy Readings include key works by representatives of these positions on topics such as reality vs appearance free will and determinism the existence of God values truth knowledge and method

320 Existentialism and Its Critics (3-0) Cr 3 Alt F offered 1993 *Prereq 201* An investigation of Existentialism and its critics in historical and cultural

context Emphasis on existential phenomenology and French existentialism *and on criticisms* Existential Marxism and Heidegger s later philosophy

330 Ethical Theory (3-0) Cr 3 F *Prereq 201 or 230* Major theories in normative ethics and meta ethics Includes such views as relativism emotivism and absolutism Comparison of ethics with science and how moral judgments are justified

331 Moral Problems in Medicine (3-0) Cr 3 Alt S offered 1995 *Prereq 230 or junior classification* In-depth study of some of the central moral problems arising in medicine e g abortion euthanasia patients rights health care professionals *duties and responsibilities allocation* of medical resources Major moral theories will be examined and applied

332 Philosophy of Law (C J St 332) (3-0) Cr 3 S *Prereq 201 or 230* Extent of our obligation to obey the law what constitutes just punishment how much of the immoral should be made illegal? Relation of these questions to major theories of law *and the state* Discussion of such concepts as coercion equality and responsibility

333 Family Ethics (3-0) Cr 3 Alt S offered 1994 *Prereq 230 or junior classification* Moral *dimensions of marriage and love parent-child* relations domestic work and moral education Can parents and children be friends? What do children owe their parents? Is there a feminist mode of moral thinking?

335 Social and Political Philosophy (3-0) Cr 3 S *Prereq 201 or 230* Foundations of social and political life Metaphysical and epistemological grounds in classical and recent thinkers The basis of political organization the nature of social and political institutions rights and authority justice and the character of distinctly political action Original texts

340 Aesthetics (3 0) Cr 3 F *Prereq 201 or 230* Is liking all there is to appreciating works of art or natural beauty? We will examine our appreciative experiences *talk* about such experiences (e g art criticism) and what makes them *valuable* Do the different arts have common values? How are their differences important?

350 Philosophy of Religion (Relig 350) (3-0) Cr 3 F *Prereq 201* The value and truth of religious life and belief Mystical experience religious faith and language arguments for God s existence the problem of evil miracles and religion and morality Historical and contemporary readings from both the western and eastern traditions

380 Philosophy of Science (3-0) Cr 3 F *Prereq 201* Introduction to the philosophy of science A variety of basic problems common to the natural and social sciences the nature of explanation the structure of theories the unity of science and the distinction between science and nonscience

381 Philosophy of the Social and Behavioral Sciences (3-0) Cr 3 S *Prereq 201 or 6 credits in the social sciences* Methodological ideological and doctrinal issues about the social and behavioral sciences against the background of influence of the natural sciences *Focus is on the historical and* cultural background of 19th and 20th century western thought

430 Value Theory (3-0) Cr 3 each time taken maximum of 6 credits S *Prereq 230* Theoretical and normative issues in ethics aesthetics religious thought or political philosophy Topics vary each time offered

442 Philosophy of Technology (T SC 442) (3 0) Cr 3 F S *Prereq 6 credits of social science or T SC 341 and 3 credits of social science* Conditions under which technological innovations contribute to *human emancipation relationship* of technology and democracy utility and limits of technical rationality and problems of ensuring that benefits of technological advance are communally shared Issues discussed with reference to contemporary developments in microelectronics technology transfer to the Third World etc

460 Epistemology and Metaphysics (3-0) Cr 3 each time taken maximum of 6 credits Alt F offered 1994 *Prereq 201 and at least one course in the history of philosophy* Issues in epistemology and metaphysics Topics vary each time offered

465 Brains Minds, and Computers (3-0) Cr 3 F *Prereq 201* Examination of concepts such as computability intelligence programming and free *will and of arguments about whether any human* capacity is forever beyond realization in a machine

470 Great Ideas in Philosophy (3-0) Cr 3 each time taken maximum 6 credits Alt F offered 1991 *Prereq 201 and at least one course in the history of philosophy* Concentrated study of one persistently intriguing philosophical issue or of a related group of them Content varies each time offered

480 Problems in Philosophy of Science (3 0) Cr 3 each time taken S *Prereq 380 or 381* Philosophical issues within a particular science e g *psychology or biology or on a problem that ranges* over a number of sciences e g the nature of explanation or the nature of scientific progress Topics will vary and be arranged to meet the needs of interested students Often team taught by a philosopher and a scientist from the relevant discipline

490 Independent Study Cr 1 to 4 each time taken *Prereq 6 credits in philosophy permission of instructor approval of chairman No more than 9 credits of Phil 490 may be counted toward graduation* Guided reading and research on special topics selected to meet needs of advanced students

H Honors

Courses Primarily for Graduate Students for minor credit, open to qualified undergraduates

590 Special Topics in Philosophy Cr 2 to 4 each time taken *Prereq Permission of instructor 9 credits in philosophy*

A History of Philosophy
B Epistemology and Metaphysics
C Value Theory
D Logic and Philosophy of Science

Physics and Astronomy

Marshall Luban Chair of Department

Professors Anderson Borsa Clem, *Crawley Finnemore Firestone* Fuchs Harmon Hill Ho Hodges Johnston Kelly Kernan Lamb Lassila Leacock Lewis Luban Lynch Peterson Rosenberg Ross *Soukoulis Stanford Stassis Vary Weber* Williams Willson Wohn Young

Emeritus Professors Barnes Bowen Earls Hammer Pursey Swenson Zaffarano

Associate Professors Cook Goldman Hauptman Kogan Shinar Struck-Marcell Tringides

Assistant Professors Appleton Dixon Kawaler Qiu Whisnant Zollner

Undergraduate Study

For the undergraduate curriculum in liberal arts and sciences major in physics leading to the degree bachelor of science see *Liberal Arts and Sciences Curriculum*

Physics and astronomy are basic natural sciences that attempt to describe and provide an understanding of our universe The study of physics is an enlightening starting point for understanding many different disciplines Students may choose physics for their major subject not only as preparation toward a career as a professional physicist or high school teacher but also as a challenging approach to personal development or as preparation for such diverse areas as engineering business administration law medicine and others Although many opportunities exist for students who terminate their studies with a bachelor s degree *those who meet the necessary* scholastic standards often continue their studies in a graduate college where opportunities exist to explore and contribute to the most recent *developments in the field*

The department normally expects each student majoring in physics to complete at least the following courses Phys 221 222 232 321 321L 322, 322L 304 306 361 364 and three credits of laboratory work from 310 311 311T or Astro 344L This is not a rigid requirement however and changes in that basic list will be approved by the departmental curriculum committee on recommendation of the student s adviser when these will better serve the individual s needs In particular students planning a physics major and also seeking certification for high school teaching may with the approval of their adviser follow a significantly different program designed to meet their special needs these students should consult the department for further information All students are required however to earn at least 5 credits in laboratory work in physics in addition to the laboratory components of Phys 221 and 222 These 5 credits must be in courses numbered 300 or higher or in approved substitutions All students must also earn at least 20 credits in physics and *astronomy courses numbered 304 or higher*

Students majoring in physics who wish an emphasis in astronomy or astrophysics *should consider completing a minor in* astronomy (see below) Those planning graduate work in physics astronomy or astrophysics should add Phys 362 365 396 480 and 481 to the basic course list one or more of Astro 445 Phys 511 524 and 537 may also be added according to interest Students planning graduate work in these areas are also strongly encouraged to study at least one foreign language A student must earn an average grade of C (or better) in astronomy and physics courses taken at Iowa State University to receive a B S in physics Further information concerning programs of study including sample degree programs is available from the department

The department offers a minor in physics which may be earned by completing 20 credits in physics courses chosen as follows Phys 221 222 either 321 or 324 at least one credit of laboratory chosen from 321L 322L 311 and 311T other acceptable courses are 304 306 322 361 362, 364 365 396 480 and 481

The department offers a minor in astronomy which may be earned by completing 15 credits chosen as follows Astro 344L a total of 12 or more credits in Astro courses with the remaining 3 credits (if applicable) chosen *from among Physics* 304 321 324 361 362 364 365 396 480 or 481 12 or more credits at the 300 level or higher

English proficiency requirement The department requires a grade of C or better in Engl 104 and 105 (or 105H) and a C– or better in Engl 204 305 or 314

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in applied physics, astrophysics high energy physics nuclear physics physics and condensed matter physics and minor work to students majoring in other departments

Facilities of the department, the Ames Laboratory and the Applied Science Center including the Microelectronics Research Center, are available for research

Students with bachelor s degrees in physics or astronomy from other institutions ordinarily will qualify for graduate study here provided they have satisfactorily completed coursework similar to that suggested for undergraduate physics majors at this university In some cases additional instruction at the intermediate level may be required

The degree master of science is offered both with and without thesis (A thesis is always required for an M S in applied physics) In either case the basic requirements are the same at least 30 credits of acceptable graduate work must be completed not less than 21 of which must be in physics or astronomy and not less than 6 either from outside the department or in areas different from the student s major area At least 15 of the credits in physics must be in courses at the 500 or 600 level exclusive of 599 and 699 Students choosing a degree with thesis may apply up to 8 credits of 699 but no credits of 599 toward the minimum 30 credits Students choosing a degree without thesis should apply 2 credits of 599 but may not apply any credits of 699 toward the minimum 30 credits

Each candidate for the doctor of philosophy degree is required to teach one year of elementary physics or astronomy In addition to coursework in the major area a candidate must take 12 minor credit hours outside this area, not less than 6 of which must be from other departments

The Department of Physics cooperates in the interdepartmental minor in Technology and Social Change (See *Technology and Social Change*) Graduate students interested in a physics minor should contact the department for requirements

Open for graduate minor credit only Phys 304 310 311 324 361 362 364 365 396 480 481, and Astro 342 344L 346

Astronomy and Astrophysics (Astro)

Courses Primarily for Undergraduate Students

120 The Sky and the Solar System (3-0) Cr 3 F S For the nonscientist The sky constellations motions of the sun moon and planets seasons and the calendar eclipses The solar system origin and evolution characteristics of the sun planets satellites comets meteorites and asteroids Extensive use of the planetarium is included

150 Stars, Galaxies and Cosmology (3-0) Cr 3 F S SS For the nonscientist Observational aspects of stellar astronomy motions distances sizes spectra types of stars variability binary systems Stellar evolution the birth life and death of stars including supernovae neutron stars and black holes The Milky Way Galaxy clouds of matter in space the structure and evolution of our galaxy Other galaxies clusters of galaxies quasars Theories of the origin of the universe

290 Independent Study Cr 1 to 4 each time taken *Prereq Permission of instructor*

342 Introduction to Solar System Astronomy (3-0) Cr 3 F *Prereq Phys 222* Analytical and comparative studies of solar system objects—planets satellites rings asteroids comets meteoroids and interplanetary dust—with emphasis on the physical processes affecting them their interactions and their evolution Orbital mechanics including perturbations stability and resonances Tidal forces and effects Radiation laws and thermal physics with applications Brief study of the sun as a star and of stellar evolution Origin and evolution of the solar system The possible formation of other planetary systems detection methods

344L Astronomy Laboratory (1-6) Cr 3 F *Prereq Phys 222* Experiments in optical astronomy Observational techniques ranging from stellar photometry to astrophotography Available instruments include 8 Mead 14 Celestron and Schmidt cameras Class meets at Fick Observatory south of Boone

346 Introduction to Astrophysics (3 0) Cr 3 S *Prereq Phys 222* Introduction to celestial mechanics Basic radiation and radiative heat transfer spectra Observational determination of stellar properties spectral classification Binary systems H R diagram Stellar populations Stellar structure and evolution white dwarfs neutron stars black holes The Galaxy structure and composition the interstellar medium Other galaxies active galaxies quasars Cosmology

***405 (505 DL) Astrophysics** (3-0) Cr 3 F *Prereq 342 or 346 Math 266* Origin and interpretation of stellar spectra Energy generation and transport nucleosynthesis Stellar structure Stellar evolution Stellar remnants

450 450L Undergraduate Research Cr 1 to 6 each time taken F S SS *Prereq 450 Permission of instructor 450L 344L and permission of instructor* 450 Research under supervision of astronomy faculty 450L Laboratory or observational project under supervision of astronomy faculty

490 Independent Study Cr 1 to 4 each time taken *Prereq 6 credits in astronomy permission of instructor No more than 9 credits of Astro 490 may be counted toward graduation*
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***505 (405 DL) Astrophysics** (3-0) Cr 3 F *Prereq 342 or 346 Math 266 permission of instructor* Origin and interpretation of stellar spectra Energy generation and transport nucleosynthesis Stellar structure Stellar evolution Stellar remnants

510 Observational Astrophysics (2 3) Cr 3 Alt F offered 1994 *Prereq 405 or 505* Techniques in optical and near IR astronomy including spectroscopy and photometry with both single channel and 2 dimensional array detectors Emphasis on projects involving proficiency in the use of small telescopes and modern instrumentation Project topics range from spectroscopic and photometric studies of pulsating and binary star systems to deep photographic and CCD imaging of faint nebulae and galaxies

518 Radio Astronomy and Astrophysics (E E 518) (3-0) Cr 3 Alt S offered 1994 *Prereq Phys 365 or E E 313* Radio astronomy fundamentals wave polarization and measurement radio telescope receivers and antennas wave propagation in plasmas synchrotron emission continuum and line spectra physical conditions in radio sources

575 Radiative Transfer Stellar Atmospheres and Spectroscopy (3 0) Cr 3 Alt S offered 1995 *Prereq 405 or 505* Radiative transfer with applications to stellar interiors atmospheres and the interstellar medium Interaction of radiation and matter line and continuum processes Statistical equilibrium Line profiles Interpretation of stellar spectra temperature pressure and abundance determinations Dynamic and extended atmospheres chromospheres coronae and stellar winds

580 Stellar Structure and Evolution (3-0) Cr 3 Alt F offered 1993 *Prereq 405 or 505* Stellar structure equations and constitutive relations energy generation energy transport by radiation and convection equation of state Solutions to the equations general theorems analytic approximations numerical techniques and results Stellar evolution from formation to final phases Nucleosynthesis recycling of material to the interstellar medium Evolution in interacting binaries Variable stars

590 Special topics Cr var

599 Creative Component Cr var *Prereq Permission of instructor* Individually directed study of research-level problems for students electing the nonthesis M S option in astronomy

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*See page 119 for information on dual listed courses

Courses for Graduate Students, major or minor

615 Galactic and Extragalactic Astronomy (3 0) Cr 3 Alt S offered 1994 *Prereq 405 or 505* The interstellar medium galactic structure dynamics of external galaxies evolution and classification of galaxies extragalactic radio sources quasars cosmological models

650 Advanced Seminar (1-0) Cr 1 each time taken F S Topics of current interest in astronomy and astrophysics Offered on a satisfactory/fail basis only

660 Advanced Topics in Astronomy and Astrophysics Cr 1 to 3 each time taken F S Topics in stellar galactic and extragalactic astronomy including stellar evolution solar physics variable stars compact objects the interstellar medium active galaxies and quasars formation and evolution of galaxies cosmology high energy astrophysics advanced observational techniques and astrophysical applications of hydrodynamics

699 Research

Physics (Phys)

Courses Primarily for Undergraduate Students

100 Introductory Seminar (1-1) Cr R F Survey of current research and other interests of physics and astronomy faculty Discussion of careers based on a major in physics Offered on a satisfactory fail basis only

101 Physics for the Nonscientist (3-0) Cr 3 F S Survey of the principal areas of both classical and modern physics Emphasis on the nature of the physical universe and the application of physical principles to life in the modern world

106 The Physics of Common Experience (4 2) Cr 4 F S SS Elementary topics from mechanics heat electricity sound and light emphasizing the use of basic principles to understand everyday experience Includes practical problem exercises and a coordinated laboratory

111 112 General Physics (4-2) Cr 4 each 111 F S SS 112 F S SS *Prereq 111 1½ years of high school algebra 1 year of geometry 1 semester of trigonometry 112 111* General background in physical concepts principles and methods for those who do not plan advanced study in physics or engineering 111 Mechanics fluids heat and thermodynamics vibrations waves sound Materials fee 112 Electricity and magnetism ray and wave optics topics in modern physics Materials fee

198 Physics of Music (2 2) Cr 3 F Introductory level course for nonphysics majors Properties of sound human perception of sound room acoustics musical scales production and analysis of musical

sounds by voice string woodwind brass and percussion instruments

221 Introduction to Classical Physics I (4 5-1) Cr 5 F S SS *Prereq Credit or enrollment in Math 166 or 176* For engineering and science majors 3 hours of lecture each week plus 3 recitations and 1 laboratory every 2 weeks Elementary mechanics including kinematics and dynamics of particles work and energy linear and angular momentum conservation laws rotational motion oscillations gravitation Electric forces and fields Electrical currents DC circuits Materials fee
H Honors S

222 Introduction to Classical Physics II (4 2) Cr 5 F S SS *Prereq 221 Math 166 or 176* Waves and sound magnetic forces and fields LR LC LCR circuits time-dependent electromagnetic fields electromagnetic waves ray optics and image formation wave optics heat thermodynamics kinetic theory of gases wave particle duality Materials fee
H Honors F

232 Computational Methods of Physics (0 2) Cr 1 S *Prereq 222* Techniques in the use of personal computers in physics including numerical modeling and integration and the processing of large data sets Experience in the use of statistical techniques to analyze data and to model physical events Programming experience is helpful but not necessary

271 Physics History, and Society I (Hist 271) (3-0) Cr 3 Alt F offered 1993 Open to all undergraduates Examination of the assumptions upon which the sciences and humanities rest The physical concepts theories and experiments of Tycho Kepler Galileo and Newton and the philosophy and history of science of Koyre Kuhn and others are studied with respect to assumptions techniques goals and results in order to illuminate the nature of scientific and humanistic thinking

272 Physics History, and Society II (Hist 272) (3 0) Cr 3 Alt F offered 1994 Open to all undergraduates The lives and physical thinking of Einstein Faraday Maxwell Lorentz and other physicists emphasis on the experiments and theories that form special and general relativity and on the historical development of the concepts of space and time Scientific and historical methods and results are compared

290 Independent Study Cr 1 to 4 each time taken *Prereq Permission of instructor*

302 The Challenge of Contemporary Physics (3-0) Cr 3 S *Prereq Sophomore classification* A largely nonmathematical but intellectually challenging exploration of physics which assumes no previous work in the field Selected material from classical and modern physics establishes the conceptual framework for the study of a major area of contemporary physics culminating in the discussion of topics at the frontier of present knowledge Research topics may vary from year to year and may include new particles quarks superconductivity lasers nuclear fusion liquid crystals solid state devices gravitational waves

304 Thermal Physics (3-0) Cr 3 F *Prereq 222 Math 266 or 371* Concepts of temperature entropy and other characteristic thermodynamic functions with application to macroscopic properties of matter The laws of thermodynamics Kinetic theory and the Maxwell velocity distribution Introduction to statistical mechanics including quantum statistics Application to black body radiation crystalline vibrations magnetic ions in solids electronic heat capacity of metals

306 Physics of Wave Motion (3 0) Cr 3 S *Prereq 222 credit or enrollment in Math 267 or 371* Oscillating systems including damped and forced oscillations fluids geometric optics water waves the wave equation Fourier and Laplace transforms non uniform media cylindrical and spherical waves transmission lines non-linear waves

310 Electronic Instrumentation for Experimental Physics (2-4) Cr 4 F *Prereq 222 Math 267* Common electrical instruments power supplies transducers passive and active devices analog integrated circuits including filters and amplifiers digital integrated circuits signal transmission and enhancement computer based data acquisition analog and digital input/output

311 Intermediate Laboratory (0-3) Cr 1 or (0 6) Cr 2 each time taken S *Prereq 322 or 324* Experiments in classical and modern physics performed independently by each student

311T Intermediate Laboratory (0-6) Cr 3 each time taken S *Prereq 112 or 222* Experiments in classical and modern physics performed independently by each student For students preparing for a career in high school teaching

321 Introduction to Modern Physics I (3-0) Cr 3 S *Prereq 222 credit or enrollment in Math 266 or 371* Quantum nature of matter photons Bohr model of hydrogen deBroglie wavelength of matter and wave packet description of particles Schrodinger wave equation in one dimension energy quantization detailed solutions for potential steps barriers and wells One-electron atoms spin and transition rates x ray and optical excitations of multi electron atoms

321L Introductory Laboratory in Modern Physics (0 2) Cr 1 S *Prereq Credit or enrollment in 321 and credit or enrollment in 232 or equivalent experience* Experiments related to the foundations of modern physics The dual wave and particle character of electrons and photons statistics interferometry and x ray spectroscopy

322 Introduction to Modern Physics II (3-0) Cr 3 F *Prereq 321* Quantum statistics lasers physics of molecules Properties of solids including electron band structure semiconducting materials and devices superconductivity and magnetism Nuclear physics including nuclear sizes and masses stability decay modes reactions fission and fusion Elementary particles including strangeness charm and quarks

322L Introductory Laboratory in Modern Physics II (0-2) Cr 1 F *Prereq Credit or enrollment in 322* Experiments related to the foundations of modern physics Radioactive decay elementary particles Hall effect spectroscopy and instrumentation

324 Elementary Modern Physics (3 0) Cr 3 F S *Prereq 222 credit or enrollment in Math 266 or 371* For students desiring a one-semester introduction to modern physics following Phys 222 students desiring a more comprehensive treatment should consider Phys 321 322 Quantization of light and energy the nuclear atom Schrodinger equation atomic physics molecular structure and spectra properties of solids

351 Solar Home Design (Arch 351) (3-0) Cr 3 S *Prereq 222* The architectural design and technical analysis of residential structures that emphasize energy conservation and solar energy utilization Field trip fee

361 Classical Mechanics (3 0) Cr 3 F *Prereq 222 Math 266 or 371* Newtonian mechanics including forced oscillations central forces and orbital motion collisions moving frames of reference Lagrange s equations

362 Intermediate Mechanics (3-0) Cr 3 S *Prereq 361* Applications of Lagrange s equations inertial and stress tensors rigid body motion small oscillations Special relativity including length contraction time dilation simultaneity Lorentz transformation 4 vector covariant formalism relativistic mechanics

364 Electricity and Magnetism I (3 0) Cr 3 S *Prereq 222 Math 385* Static electric and magnetic fields potential theory electromagnetism Maxwell s equations

365 Electricity and Magnetism II (2-0) Cr 2 F *Prereq 364* Relativistic electromagnetic theory radiation and propagation of electromagnetic waves interaction with matter

396 Modern Optics (3-0) Cr 3 S *Prereq 321 or 324 or Chem 322 or Chem 325* Geometrical optics via Fermat s principle diffraction and holography fiber optics and devices lasers and interferometry quantum optics and noise

399 Seminar on Secondary School Physics (2-0) Cr 1 F S *Prereq Permission of instructor* Review of materials and curricula for secondary school physics presented and discussed by members of the class Required for approval to teach physics in secondary schools

450 450L Undergraduate Research Cr 1 to 6 each time taken F S SS *Prereq 450 Permission of instructor 450L 311 permission of instructor* 450 Experimental or theoretical research under supervision of physics faculty 450L Laboratory project under supervision of physics faculty

480 Quantum Mechanics (3-0) Cr 3 F *Prereq 322 Math 385* A systematic development of quantum mechanics including differential and operator solutions of the Schrodinger equation matrix formulation of eigenvalue problems the hydrogen atom electron spin identical particles and angular momentum

481 Atomic and Molecular Physics (2-0) Cr 2 S *Prereq 480* Perturbation theory Clebsch Gordan coefficients Zeeman effect Stark effect hyperfine interaction helium atom many-electron atoms Hartree equation hydrogen molecule and ion molecular spectra time-dependent perturbation theory radiation in atoms scattering theory

489 Tutorial Seminar (1-0) Cr 1 each time taken F S *Prereq Permission of instructor* For junior and senior physics majors Topics of interest in physics discussed in small groups Offered on a satisfactory fail basis only

490 Independent Study Cr 1 to 4 each time taken *Prereq 6 credits in physics permission of instructor No more than 9 credits of Phys 490 may be counted toward graduation*
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Introductory Research Seminar (1 1) Cr R F Discussion by research staff of their research areas expected thesis research work and opportunities in the field For graduate physics majors only Offered on a satisfactory fail basis only

511 512 Solid State Physics (3-0) Cr 3 each 511 S 512 F *Prereq 511 304 322 512 511* Free electron model crystal symmetry band theory of solids transport properties Fermi surface phonons semiconductors magnetism superconductivity

515 Physical Processes in Plasma (E E 515) See *Electrical Engineering*

516 Wave Phenomena in Plasma (E E 516) See *Electrical Engineering*

524 Nuclear Physics (3-0) Cr 3 F *Prereq Credit or enrollment in 480* Basic properties and structure of nuclei introduction to nuclear models Nuclear reactions decay and stability electromagnetic interactions Accelerators and detectors

528 Atmospheric Physics (Mteor 528) (3-0) Cr 3 Alt S offered 1995 *Prereq 304 322 361 and 364* Physics of fluids as applied to the atmosphere equations of motion conservation laws atmospheric waves small to planetary scale remote sensing by satellites

531 Statistical Mechanics (3-0) Cr 3 F *Prereq 304 Math 465 credit or enrollment in Math 426 or 365* Thermodynamic properties of systems of many particles obeying Boltzmann Fermi Dirac and Bose Einstein statistics microcanonical canonical and grand canonical ensembles and their application to physical problems density matrices introduction to phase transitions kinetic theory and fluctuations

535 Semiconductor Device Theory and Technology I (E E 535) See *Electrical Engineering and Computer Engineering*

536 Semiconductor Device Theory and Technology II (E E 536) See *Electrical Engineering and Computer Engineering*

537 High Energy Physics (3-0) Cr 3 S *Prereq 480* Experimental methods conservation laws and

invariance principles weak electromagnetic and strong interactions quark model symmetry schemes and dynamical models

541 General Relativity (3-0) Cr 3 Alt S offered 1994 *Prereq 362 or Math 465* Tensor analysis and differential geometry developed and used to formulate Einstein field equations Schwarzschild and Kerr solutions Other advanced topics such as alternate gravitational theories attempts at unified field theories cosmology

551 Computational Physics (0-2) Cr 2 F *Prereq 365 480* Use of modern computational techniques to analyze topics in classical and modern physics

564 Advanced Classical Mechanics (3-0) Cr 3 F *Prereq 361 Math 426 465* Variational principles Lagrange s equations Hamilton s canonical equations canonical transformations Hamilton Jacobi theory infinitesimal transformations classical field theory

571 572 Advanced Electricity and Magnetism (3 0) Cr 3 each 571 S 572 F *Prereq 571 365 Math 426 572 571* 571 Electrostatics magnetostatics boundary value problems Maxwell s equations wave phenomena in macroscopic media wave guides 572 Special theory of relativity least action and motion of charged particles in electromagnetic fields radiation collisions between charged particles multipole fields radiation damping

590 Special Topics Cr var *Prereq Permission of instructor* Topics of current interest
A Nuclear Physics
B Condensed Matter Physics
C High Energy Physics
D Physics
E Applied Physics

591 592 Quantum Physics (4-0) Cr 4 each Yr *Prereq 591 480 592 591* Time-dependent and time-independent Schrodinger equations for one two- and three-dimensional systems bound systems methods of quantum scattering linear vector spaces angular momentum theory and intrinsic spin perturbation methods identical particles and exchange effects symmetries applications in physics and chemistry

599 Creative Component Cr var *Prereq Permission of instructor* Individually directed study of research level problems for students electing the nonthesis M S degree option

Courses for Graduate Students, major or minor

611 Quantum Theory of Condensed Matter (3-0) Cr 3 S *Prereq 512 681* Electronic band structure photons X-ray neutron and electron scattering dielectric response Boltzmann equation optical properties magnetism superconductivity

632 Semiconductor Physics (E E 632) (3-0) Cr 3 Alt S offered 1994 *Prereq 480 481 511* Band structure statistical mechanics of electrons and holes galvano-magnetic effects magnetoresistivity cyclotron resonance transport properties principles of junctions and heterostructures optical properties amorphous semiconductors quantum well structures

637 638 Elementary Particle Physics (3-0) Cr 3 each 637 Alt S offered 1994 638 Alt F offered 1994 *Prereq 637 537 592 638 637* Properties of leptons bosons and quarks and their interactions quantum chromodynamics Glashow Weinberg-Salam model grand unification theories supersymmetry and superstring theory modern theoretical techniques

650 Advanced Seminar (1-0) Cr 1 each time taken F S Topics of current interest Offered on a satisfactory fail basis only
A Nuclear Physics
B Condensed Matter Physics
C High Energy Physics
D Physics
E Applied Physics

660 Advanced Topics in Physics Cr 1 to 3 each time taken F S Courses on advanced topics and recent developments
A Nuclear Physics
B Condensed Matter Physics
C High Energy Physics
D Physics
E Applied Physics

674 Applications of Group Theory to Physics Condensed Matter Physics (3-0) Cr 3 Alt F offered 1993 *Prereq 592* Theory of groups and group representations point space and rotation groups applications to molecular and crystal structures crystal field and spin-orbit interactions energy bands and phonon dispersion relations

675 Applications of Group Theory to Physics Nuclear and High Energy Physics (3-0) Cr 3 Alt S offered 1994 *Prereq 592* Theory of Lie groups Lie algebras and their representations Survey of the Lorentz group Poincaré group SU(3) and other Lie groups of physical importance Applications to nuclear and elementary particle physics

681 Advanced Quantum Mechanics (3-0) Cr 3 F *Prereq 592* Relativistic quantum mechanics second quantization introduction to quantum electrodynamics

682 Quantum Field Theory (3-0) Cr 3 Alt S offered 1995 *Prereq 681* Field quantization function integrals Feynman rules and renormalization Abelian and non Abelian gauge theories

699 Research

Plant Health and Protection

(Interdepartmental Undergraduate Program)

Advisory Committee Ed Braun Chair E Hart C Martinson G Nonnecke B Pearce F Troeh P Wray

Undergraduate Study

For undergraduate major in plant health and protection leading to the degree bachelor of science see *Agriculture Curricula*

The undergraduate program in plant health and protection is adapted to students with a career interest in the holistic approach to the science and technology of plant health maintenance in the varied ecosystems of our earth The production and sustainability of plant products and services from these ecosystems require knowledge and understanding of the scientific and sociological forces that underlie plant health protection and maintenance The major allows further specialization in supporting areas in agriculture such as agronomy entomology forestry horticulture plant pathology and the basic biological and physical sciences, depending on the goals and interests of the individual student These individualized programs prepare graduates for employment in a wide range of agriculture-related industries and federal and state agencies The major also offers excellent opportunity in preparation for graduate study in plant science disciplines

Students desiring to major in plant health and protection must register with the chair of the advisory committee After consultation with the chair a plant health and protection adviser will be assigned depending on the interests of the student

The program also offers a minor in plant health and protection which may be earned by credit in 206 391 Agron 354 Hort 420 or For 301 and two of the following Ent 376 Pl P 407 or 416 Agron 317

The program has cooperative work-experience internships with industry and governmental agencies for interested and qualified students Practical experience through part-time employment during the student s formal educational program is required (Pl HP 392) Such experience is available with private industry and public agencies and within the participating departments of Agronomy Entomology Forestry Horticulture and Plant Pathology

Courses Primarily for Undergraduate Students

110 Orientation in Plant Health and Protection (1-0) Cr R F *Prereq Required of students in the plant health and protection curriculum* Requirements and career opportunities in the fields of plant health and protection

206 Plant Health Biology (3-0) Cr 3 S *Prereq Biol 109 or 201* Biology of plant health and protection Impact of biotic and abiotic stresses on the growth and reproduction of plants

301 Forest Ecology (For 301) See *Forestry*

317 Principles of Weed Science (Agron 317) See *Agronomy*

354 Soil Fertility (Agron 354) See *Agronomy*

354L Soil Fertility Laboratory (Agron 354L) See *Agronomy*

376 Fundamentals of Entomology and Pest Management (Ent 376) See *Entomology*

391 Clinical Plant Health (0-4) Cr 2 F *Prereq 6 credits in plant health and protection* Diagnosis of plant health problems Identification of biotic and abiotic plant stresses Synthesis of recommendations Correspondence with clients

392 Plant Health and Protection Work Experience Cr R *Prereq 6 credits in plant health and protection permission of advisory committee* Practical work experience in the management of plant health in agronomic horticultural or forest systems Diagnosis problem assessment and management procedures For majors and advanced students

407 Principles of Plant Pathology (Pl P 407) See *Plant Pathology*

416 Forest Pest Management (Pl P 416) See *Plant Pathology*

420 Plant Nutrition (Hort 420) See *Horticulture*

490 Independent Study Cr 1 to 3 *Prereq Junior or senior classification 6 credits in plant health and protection permission of instructor A maximum of 6 credits of 490 may be used toward the total of 128 credits required for graduation*
A Plant Health and Protection
H Honors

498 Plant Health Management (1-6) Cr 3 F *Prereq 391* Problem solving skills in plant health and protection through study of case histories and actual problems submitted by clients in the field Group dynamics and communication skills stressed

Plant Pathology

Thomas C Harrington Chair of Department

Professors Epstein Harrington Hill Hodges McGee McNabb Stuckey, Tiffany

Emeritus Professors Everson Isely Norton

Associate Professors Braun Bronson Gleason Martinson Nutter Vakili

Assistant Professors Miller Munkvold Tylka Wise Yang

Undergraduate Study

The department participates in the undergraduate major and minor in plant health and protection see *Agriculture Curricula*

For a second major in pest management see *Agriculture Curricula*

Graduate Study

The department offers studies for the degrees master of science and doctor of philosophy with a major in plant pathology and minor work for students majoring in other departments or programs A master of science *nonthesis option* is available The department also participates in the interdepartmental majors in toxicology genetics plant physiology and molecular cellular *and developmental biology*

Students entering graduate programs in the department need a sound background in the physical biological and mathematical sciences as well as adequate preparation in English

Open to graduate students for minor credit only 407 416 493

Courses Primarily for Undergraduate Students

407 Principles of Plant Pathology (Pl HP 407 P M 407) (2-3) Cr 3 F *Prereq 8 credits in biological sciences including Bot 207 or Biol 202* Braun Principles underlying the nature diagnosis and management of plant diseases Laboratory complements lecture topics and provides experience in plant disease diagnosis

416 Forest Pest Management (For 416 Ent 416 Pl HP 416 P M 416) (2 6) Cr 4 S *Prereq 8 credits in biological sciences including Bot 207 or Biol 202* McNabb Hart Nature of forest shade tree and wood pests physical agents of tree damage integrated case studies and computer simulations in the evaluation and economic analysis of protection and pest management problems weekend field trip Fee for *field trip*

483 Wood Deterioration and Preservation (For 483) See *Forestry*

493 Causal Organisms of Plant Diseases Cr 1 (40 hour workshop) *Prereq 6 credits in biological sciences* Characteristics and life cycles of fungi bacteria nematodes viruses and how each causes plant disease Population dynamics and theories of plant pathogen management *Offered on a* satisfactory fail basis only

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

503 Biology of Plant Pathogens (3 0) Cr 3 F *Prereq Bot 207 Gen 330 or Biol 301* Harrington Braun Hill Tylka Biology ecology and taxonomy of organisms that cause plant disease

506 Plant Pathogen Interactions (2-0) Cr 2 S *Prereq Pl P 407 or 416 or 503 Gen 330 or Biol 301* Bronson Miller Genetics of disease resistance and pathogenicity Introduction to mechanisms of plant-parasite interaction

507 Epidemiology and Disease Management (2-0) Cr 2 S *Prereq Pl P 407 or 416 or 503* Nutter Martinson Principles of pathogen population dynamics as affected by environment and host genetics Utilization of epidemiological principles for disease management gene management strategies

509 Plant Virology (MIPM 509) (2-6) Cr 4 Alt S offered 1995 *Prereq 407 or 503 Bot 404 B B 405 Chem 211* Hill Plant viruses and the diseases they cause Emphasis on epidemiology and control Structure function and biochemical biophysical properties of plant viruses

543 Plant Disease Epidemiology (2-4) Cr 4 Alt F offered 1994 *Prereq 407 or 416 or 503* Nutter *Analysis of the factors that alter the course of plant* disease epidemics Laboratory emphasizes techniques for qualitative and quantitative measurement and modeling of epidemics

552 Diseases of Turfgrasses (Hort 552) *See Horticulture*

574 Plant Nematology (2 3) Cr 3 Alt S offered 1994 *Prereq 407 or 416 or 503* Tylka Morphology anatomy and life cycles of common plant parasitic nematodes symptom expression interaction with other soil microorganisms control

576 Bacterial Diseases of Plants (2 3) Cr 3 Alt S offered 1994 *Prereq 407 or 416 or 503* Braun Characteristics of prokaryotic plant pathogens and the diseases they cause Laboratory emphasizes techniques used in studying bacterial plant *pathogens*

590 Special Topics Cr 1 to 3 each time taken *Prereq 10 credits in biological sciences permission of instructor*

591 Plant Disease Control (2 3) Cr 3 F *Prereq 407 or 416 or 503* Martinson Principles and practices of disease control with an emphasis on fungal diseases Use of biological control resistance and chemical control in disease management

592 Molecular Biology of Plant Pathogen Interactions (MCDB 592) (2 3) Cr 3 Alt F offered 1993 *Prereq 407 or 416 or 503 B B 405 or Gen 420 or MIPM 402 or other course in molecular biology* Miller Bronson Molecular and physiological mechanisms of plant disease and resistance Phytoalexins elicitors specific toxins signal *transduction gene for gene systems Agrobacterium* virus-host interactions

594 Seed Pathology (2-3) Cr 3 Alt S offered 1995 *Prereq 407 or 503* McGee Significance of diseases on the major *phases of seed production* growing harvesting conditioning storing and planting seed Pathogens considered include fungi bacteria viruses nematodes and abiotic agents Emphasis on control epidemiology host parasite relationships and seed health testing

Courses for Graduate Students, major or minor

608 Molecular Virology (MIPM 608) See *Microbiology Immunology and Preventive Medicine*

691 Clinical Plant Pathology (0 6) Cr 2 each time taken Alt SS offered 1994 *Prereq 407 or 416 or 503* Diagnosis of plant diseases isolation and identification of pathogens clinical experience plant *disease survey detection and evaluation methods*

694 Colloquium in Plant Pathology (2 0) Cr 2 each time taken F S *Prereq 407 or 416 or 503 permission of instructor* Advanced topics in plant pathology *including biological control genetic* engineering for disease resistance chemical control fungal genetics disease cytology and professional communications

698 Seminar Cr 1 F S

699 Thesis and Dissertation Research Cr var

Plant Physiology

(Interdepartmental Graduate Major)

Supervisory Committee M H Spalding Chair J S Burris D J Hannapel R M Shibles C R Stewart

Work is offered for the degrees master of science (thesis option only) and doctor of philosophy with a major in plant physiology in the following participating departments Agronomy Biochemistry and Biophysics Botany Forestry Horticulture Plant Pathology and Zoology and Genetics Facilities and qualified faculty are available in these departments for training in basic research in various aspects of the physiology *and molecular* biology of plants

Students majoring in plant physiology must be admitted by both a department and the *interdepartmental major Two members of* the student s program-of-study (POS) committee including the major professor or a co-major professor must be from the faculty of the interdepartmental major

All M S students must meet the following minimum requirements (1) enroll each term and make one presentation each year in the interdepartmental plant physiology seminar (Bot 696 or its cross-listed equivalents) and (2) complete two courses chosen from the following Bot 511 512 513 B B 404 and 405 or 501 and 502 and Stat 401 A course in physical or biophysical chemistry is recommended

All Ph D students must complete the following requirements in addition to those for the M S Bot 511 512 513 one course chosen from Bot 545 Gen 411 or Gen 520 one course chosen from B B 411 511 Bot 583 or Gen 520L and one course in physical or biophysical chemistry (B B 451 for example) Stat 402 is recommended

In consultation with his or her major professor and the POS committee a student may select additional courses from an approved list available from the chair of the supervisory committee of the *interdepartmental major*

Political Science

Richard W Mansbach Chair of Department

Professors Dearin Kihl Mansbach McCormick Moses Rasmussen Sandler Schmidt Shelley Smith Uhl

Emeritus Professors Boles Hadwiger Parks Talbot

Associate Professors Dobratz Hutter Koven Lee Maney Whitmer

Assistant Professors Banaszak Clark-Daniels Dombrowski Duffy Plutzer Shakeshaft Stubben

Undergraduate Study

For the undergraduate curriculum in Liberal Arts and Sciences with major in political science, leading to the degree of bachelor of arts see *Liberal Arts and Sciences Curriculum*

The study of political science is designed to enable students to become familiar with theories of public values and patterns of political systems—national regional and international A political science major should complete a broad liberal arts program which would maximize opportunities for study in related social science disciplines as well as in various areas of the humanities

Each student majoring in political science will develop a research tool This requirement may be met by either successful completion

of two years of foreign language or completion of Pol S 301

Students majoring in political science may substitute a second major in international studies in place of an optional minor in the College of Liberal Arts and Sciences See *International Studies*

The department offers a minor in political science which may be earned by completing 15 credits of coursework in political science nine of which shall be at the 300 level or above

A political science minor has been used by many students with majors in other disciplines The availability of the minor is noted because so many occupations and activities are affected by politics and governmental activity For information on a minor in political science contact the department office

A *prelaw* undergraduate program of study is offered and can be pursued through a major in political science A more complete statement is available in the department office See also *Preprofessional Study*

A detailed statement of departmental requirements for the major and minor may be obtained from the department office

To be certified for the LAS English proficiency requirement political science majors must earn at least a C+ in both Engl 104 and 105 Those who do not must enroll in Engl 204 or 314 and earn at least a C Students should fulfill this requirement by the end of their junior year

The political science major also has the opportunity to participate in The Washington Center internship program The student may gain academic credit and first-hand experience through either a governmental non-profit or private sector internship in Washington D C through this program Up to 12 academic credits may be earned and tuition fees may be used to defray the costs associated with this internship opportunity A complete description of the program as well as the fee and credit arrangements are available from the departmental office

Graduate Study

The department offers work for the degree master of arts degree (M A) with major in political science and minor work to students majoring in other departments

The M A program is designed to enable its graduates to engage in governmental research enter public service or private industry pursue further graduate study or teach A thesis is required for this degree A specialization in public administration is possible The department also has a joint master of arts/juris doctor (M A /J D) program with the Law School of Drake University In addition graduate students may wish to work for certification for high school or junior college teaching

The department also offers a master of public administration (M P A) degree This is a professional degree designed to provide interested students with the training necessary to work within a public bureaucracy or organization The M P A degree requires 39 semester credit hours Both thesis and nonthesis options are available

Brochures setting forth detailed requirements for all graduate degrees may be obtained from the departmental office

A usual prerequisite for major graduate work in the department is the completion of at least 15 semester credits in political science The Graduate Record Examination (verbal and quantitative portions) is required

Each student entering the master of arts program in political science is expected to have completed one year of a foreign language (equivalent to 8 semester credits) and a course in basic statistics (equivalent to Stat 101) If this has not been done the student may remedy the deficiency by passing equivalent courses for which no graduate credit will be received

In addition each student must complete one of the following requirements

1 Language—Two years of undergraduate instruction (including the one year of foreign language provided above) in a single language with grades averaging 2 7 (on a 4 0 scale) or a passing grade in the Educational Testing Service examination

2 Statistics—Successful completion of Stat 401 Stat 404 is recommended but not required

These are the minimum requirements The student s program of study committee will decide if additional work in either language or statistics is necessary

The department cooperates in the interdepartmental program in industrial relations interdepartmental majors in transportation planning and water resources and interdepartmental minors in gerontology mineral resources and technology and social change (See *Index*)

Courses open to graduate students for minor credit only 343 405 406 410 413 417 420 421, 422 430 431 433 443 451 452 453 464 470 471 475 476 480 481 482 484

Courses Primarily for Undergraduate Students

215 American Government Institutions and Policies (3 0) Cr 3 F S Fundamentals of American democracy constitutionalism nature of federalism rights and duties of citizens institutions and processes of the executive legislative and judicial branches of government role of public opinion interest groups and political parties Policies and problems of national government

230 Introduction to Law and Politics ** (3-0) Cr 3 A general introduction to the basic concepts and theories of the state and of law including such philosophic issues as authority power legitimacy freedom and political obligation Readings from theories in political philosophy jurisprudence constitutionalism and related areas of thought

241 Introduction to Comparative Government and Politics (3 0) Cr 3 F S Basic concepts and major theories application to selected political systems including non western and communist political systems

251 Introduction to International Politics (3-0) Cr 3 F S Dynamics of interstate relations pertaining to nationalism the nation state peace and war foreign policy making the national intere t military capability and strategy case studies of transnational issues such as population food energy and terrorism

301 Introduction to Empirical Political Research ** (3 2) Cr 4 *Prereq 3 credits in political science Stat 101 recommended* Techniques of empirical political research and analysis surveys methods of data collection applications of statistics and computer techniques

305 Political Behavior ** (3-0) Cr 3 *Prereq Sophomore classification* Hutter Empirical theories and descriptions of political behavior including decision making voting opinion and attitudes of both the public and political elites

306 Political Decision-Making and Conflict Resolution (3-0) Cr 3 Alt yr ** *Prereq 3 credits in political science* Study of domestic and international political conflict in both quasi historical and hypothetical scenarios by means of simulation and gaming Utility of simulation as a heuristic device factors influencing the decision making process through which conflict is resolved

310 State and Local Government ** (3-0) Cr 3 *Prereq 3 credits in political science* Role of state and local governments in the American federal system Structures of participation political parties elections interest groups Major governmental institutions legislative executive and judicial Structure and functions of local governments

311 Municipal Government and Politics ** (3 0) Cr 3 *Prereq 215* Maney Legal position of municipal corporation forms of organization administration of municipal services problem solving in municipal government urban and metropolitan political process implications of federal urban policies

*****312 Minicourse in American Government and Politics **** (3-0) Cr 2 8 weeks *Prereq Sophomore classification* Half-semester courses on significant topical issues in American government and politics

*****313 Minicourse in Theory and Methods **** (3 0) Cr 2 8 weeks *Prereq Sophomore classification* Half semester course on significant topical issues in theory and methods in political science

*****314 Minicourse in Comparative Politics **** (3-0) Cr 2 8 weeks *Prereq Sophomore classification* Half semester course on significant topical issues in comparative politics

*****315 Minicourse in International Relations **** (3 0) Cr 2 8 weeks *Prereq Sophomore classification* Half semester course on significant topical issues in international relations

320 American Judicial Process ** (C J St 320) (3 0) Cr 3 *Prereq 215* Shakeshaft The genesis structure processes and personnel of American courts basic juridical concepts restraints on exercise of the judicial power major eras of American constitutional history an overview of civil liberties impact of court decisions on public policy

340 Politics of Developing Areas ** (3-0) Cr 3 Analysis of indices of underdevelopment as they relate to the political process of developed states Impact of social and technological change on political systems of developing areas Some case studies

341 Politics of Japan (3 0) Cr 3 Alt yr ** Kihl Political traditions and cultures Contemporary governmental structures and processes Examination of public policy issues in Japan as a post industrial society

342 Politics of China (3-0) Cr 3 Alt yr ** Kihl The Chinese Revolution origins political theory and practice party and government China as a modernizing nation including the problems of leadership succession and economic transformation

343 Latin American Government and Politics (3-0) Cr 3 Alt yr ** *Schmidt Political institutions* processes and contemporary issues Selected countries examined intensively to illustrate generalizations Role of parties military church interest groups and ideology

344 Public Policy ** (3-0) Cr 3 Duffy How political agendas come to be set in public policy the politics of the policy making process political forces *molding* policy choices and the impact of such choices The major areas of regulation social policy fiscal and planning

345 British Politics ** (3 0) Cr 3 Rasmussen *Social and cultural context of British politics* Parties elections and governmental structures Substance and process of public policies in selected problem areas

346 Governments of Western Europe ** *(3 0)* Cr 3 Banaszak Rasmussen Comparative study of political institutions of France Germany and Italy emphasis on parties elections and governmental structures Substance and process of public policies in selected problem areas

347 Introduction to African Politics (3-0) Cr 3 Alt yr **Traditional political cultures of sub-Saharan Africa colonial regimes and rise of nationalism modern political processes and institutions illustrations from various parts of sub-Saharan Africa

348 Israel and the Middle East (3 0) Cr 3 Alt yr ** *Prereq 241 or comparable background in Middle East/Israeli history* Moses Major factors that have shaped and continue to influence the distinctive nature of Israeli society and politics Patterns and determinants of Mideast international relations as reflected in Arab Israeli conflict sources of foreign policymaking in Israel and Arab states and Soviet and American involvement since 1945

349 Politics of Russia and Central Eurasia ** (3-0) Cr 3 *Prereq 241 or comparable background in Soviet/Russian history* Moses Nation-states of the former Soviet Union Analysis of Soviet Communist system 1917-85 and the politics and revolutionary conflict leading to the dissolution of the Soviet Union from 1985 through 1991 Problems of post *Soviet nation states of Russia and Central Eurasia* since 1991

355 Foreign Policy of Soviet Union Russia and Central Eurasia ** (3 0) Cr 3 *Prereq 251 or comparable background in Soviet/Russian history* Moses History and determinants of Soviet foreign policy from 1941 through 1991 emphasizing Soviet relations with Europe the United States China and the Third World Foreign relations of the post Soviet states of Russia and Central Eurasia since 1991

357 International Security Policy (3-0) Cr 3 Alt yr ** The major theoretical approaches in security policy—strategy and deterrence game theory bargaining theory compellance and coercive diplomacy and crisis diplomacy Illustration of these various approaches through historical and contemporary cases the outbreak of World War I the Cuban missile crisis and U S Soviet arms control negotiations

358 United States Foreign Policy ** (3 0) Cr 3 *Prereq 215 or 251 or Hist 467 or 470 or 471* McCormick U S foreign policy since World War II with emphasis on changing American values in foreign policy the role of the President Congress and the bureaucracy in policy making and a survey of current foreign policy issues and problems

360 Congress and the State Legislatures ** (3-0) Cr 3 *Prereq 215* Theory of representation in democratic government Organization procedures voting patterns and leadership roles of United States Congress and state legislatures

361 The President and the State Governors ** (3-0) Cr 3 *Prereq 215* Creation and historical development of the office of chief executive character and behavior of past chief executives selection and control powers roles functions executive staff relations with Congress press public opinion

371 Introduction to Public Administration ** (3-0) Cr 3 *Prereq 215* The development of public administration in federal state and local government Analysis of the organization and operations of public agencies in terms of efficiency and effectiveness in developing and implementing public policy

385 Women in Politics ** (W S 385) (3-0) Cr 3 Development of feminism in western democracies interest groups and leadership in the struggle for political power countervailing socioeconomic forces that have inhibited women s participation in politics and government contemporary issues and strategies for change through the political process emphasis on the United States

405 Political Socialization and Political Attitudes ** (3-0) Cr 3 *Prereq 6 credits in political science or junior classification* The acquisition of political attitudes by pre adults and adults Implications for national identity political culture and public opinion

406 Public Opinion, Voting Behavior and Elections ** (3-0) Cr 3 *Prereq 6 credits in political science or junior classification* Consequences of public opinion and social background for voting behavior campaigns and elections

410 Iowa Government and Politics ** (3 0) Cr 3 *Prereq 215* Analysis of Iowa government and politics public opinion and political participation governmental institutions and major policy issues *

413 (513 DL) Federalism and Intergovernmental Relations (3-0) Cr 3 Alt yr ** *Prereq 6 credits in American government* Maney Theory and practice of the American federal system patterns of conflict and sharing in the 19th century development and expansion of the federal grant-in-aid system politics and policy making among federal state and local governments techniques of intergovernmental relations

417 Campaign Rhetoric (Sp Cm 417) See *Speech Communication*

420 Constitutional Law ** (3 0) Cr 3 *Prereq 215 junior classification* Development of the United States Constitution through judicial action influence of public law and judicial interpretations upon American government and society

421 Civil Liberties ** (3 0) Cr 3 *Prereq 215 junior classification* American constitutional and statutory guarantees of civil rights First Amendment rights of conscience and freedom of expression as well as rights of defendants Application of equal protection of laws to minority groups Various reform proposals

422 International Law ** (3 0) Cr 3 *Prereq 215 or 251 junior classification* Development of the principles of international law of peace and war analysis of theories concerning its nature and fundamental conceptions its relation to national law problems of international legislation and codification

430 Development of Political Thought Classical Thought through Early Contract Theory ** (3-0) Cr 3 *Prereq 6 credits in political science philosophy or European history* Shakeshaft Major concepts in original texts of classical medieval and early modern authors friendship community man s basic nature natural law force society outside the political order Emergence of the modern state and sovereignty in the transition to secular authority Relevant historical considerations contemporary applications Plato through Hobbes

***431 (531 DL) Development of Political Thought Modern and Contemporary Political Thought** ** (3-0) Cr 3 *Prereq 6 credits in political science philosophy or European history* Shakeshaft Original texts and relevant historical considerations Human nature and its influence on contract theory private rights differing connotations of liberty sovereignty constitutionalism dialectical materialism bureaucracy law democratic theory Locke through Marx Mill and contemporary authors

433 American Political Thought (3-0) Cr 3 Alt yr ** *Prereq 6 credits in political science or in American history* Review of major political concepts and theorists in American political history Analysis of current concepts in U S political thought and their possible impacts on our political institutions

443 The U S and Latin America (3-0) Cr 3 Alt yr ** *Prereq 241 or 251 or 343* Schmidt Analysis of the political consequences of Latin American dependency and growth of nationalism Monroe Doctrine aid revolution nationalization multinational corporations

451 International Politics of Asia (3-0) Cr 3 Alt yr ** *Prereq 241 or 251* Kihl International politics of Asia emphasis on shifting power balance role of major powers security dilemma foreign policies of small nations prospect for regional integration

***452 (552 DL) Comparative Foreign Policy** (3 0) Cr 3 Alt yr ** *Prereq 251* Kihl McCormick Various theoretical approaches to explain foreign policy making and behavior through the use of case studies of selected nations

453 International Organizations (3 0) Cr 3 Alt yr ** *Prereq 251* Kihl Private and public organizations such as the United Nations other specialized agencies and multinational organizations and their influence on our daily lives

464 Political Parties and Interest Groups in American Politics ** (3 0) Cr 3 *Prereq 215* Structure and operations of interest groups and parties relationships between parties and interest groups and functions they perform in the political system campaign practices of both

470 Public Choice (Econ 470) See *Economics*

471 Administrative Politics ** (3-0) Cr 3 *Prereq 215* The regulatory process structure and politics of regulatory agencies political interactions of agencies legislators interest groups and the legal system

***475 (575 DL) Management in the Public Sector** (3-0) Cr 3 Alt yr ** *Prereq 371* Lee Contemporary literature and research on *organizational behavior and management* theory productivity communication and information technology conflict resolution and policy planning and decision making in the public sector

***476 (576 DL) Administrative Law** (3-0) Cr 3 Alt yr ** *Prereq 215 junior classification* Constitutional problems of delegation of governmental powers elements of fair administrative procedures judicial control over administrative determinations

***480 (580 DL) Ethics and Public Policy** (3-0) Cr 3 Alt yr **Prereq 6 credits in political science* Major ethical concepts in U S political philosophy The controversy over public versus private morality in political policy making Analysis of public decision making case studies with emphasis on ethical considerations Major proposals and legislation related to improving the quality of ethical criteria and decisions in public policy making

***481 (581 DL) International Political Economy** ** (3-0) Cr 3 *Prereq 6 credits in political science* An overview of the international political economy since the end of World War II Special emphasis on national (primarily U S) development assistance and agricultural/food politics and policies and those of the international food organizations the World Bank and the regional development banks

482 Environmental Politics and Policies (Env S 482) (3 0) Cr 3 Alt yr **Prereq 6 credits in political science* Major ideologies relating to conservation and ecology Primary emphasis on the policy making process in U S national and state governments with principal application to environmental and land-use policies Major *proposals for improvement in policy content and* process

***484 (584 DL) Rural and Small Community Development Policy** (3 0) Cr 3 Alt yr ** *Prereq 215* Major policies *local governments* intergovernmental relations and significant groups and coalitions active in rural and small community environments in developed countries Education poverty housing recreation health conservation

and environment research and extension manpower and agriculture

490 Independent Study Cr var F S *Prereq 6 credits in political science No more than 9 credits of Pol S 490 may be counted toward graduation* Special studies in the political institutions processes and policies of American foreign and international governments Also studies in traditional and behavioral political theory
- A American Government and Politics
- B Theory and Method
- C Comparative Politics
- D International Relations
- E Extended credit The student may earn an additional 1 or 2 credits for extra study done for any 300 or 400-level course with instructor s approval
- H Honors

499 Internship in Political Science Cr var F S *Prereq 6 credits in political science and permission of instructor* Work experience with a specific nongovernmental or governmental agency at the local state national or international level combined with academic work under faculty supervision Normally available with junior or senior classification

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

502 Political Analysis ** (3 0) Cr 3 *Prereq 6 credits in political science* Introduction to systematic reasoning and analysis in political science Concepts hypotheses and major theories introduced Alternative methods of analysis surveyed

503 Political Research ** (3 0) Cr 3 *Prereq 6 credits in political science* Principles of scientific empirical research applied to political data and public policies Research design ethics role of theory types and sources of data Survey research voting analysis program evaluation computer utilization interviewing review of algebra and the role of statistical techniques in research

510 State Government and Politics (3-0) Cr 3 Alt yr ** *Prereq 310* Comparative analysis of state political systems Role of interest groups political parties legislatures courts and governors in state politics Possible determinants of public policy outputs at the state level

512 Urban Politics and Administration ** (3-0) Cr 3 *Prereq 311* Maney Structure and process of urban politics and the metropolitan political systems problems in urban management and intergovernmental relations theoretical perspectives on urban politics and policy

***513 (413 DL) Federalism and Intergovernmental Relations** (3 0) Cr 3 Alt yr ** *Prereq 6 credits of American government* Maney Theory and practice of the American federal system patterns of conflict and sharing in the 19th century development and expansion of the federal grant-in aid system politics and policy making among federal state and local governments techniques of intergovernmental relations

531 (431 DL) Development of Political Thought Modern and Contemporary Political Thought * (3 0) Cr 3 S *Prereq 430* Shakeshaft Original texts and relevant historical considerations Human nature and its influence on contract theory private rights differing connotations of liberty sovereignty constitutionalism dialectical materialism bureaucracy law democratic theory Locke through Marx Mill and contemporary authors

544 Comparative Public Policy (3-0) Cr 3 Alt yr ** *Prereq 6 credits in political science* Moses Examines how why and to what effect governments deal with substantive policy problems differently Environmental factors ideologies cultures domestic policy making processes and interest groups

547 Political Leadership and Elites *Prereq 6 credits in political science* Schmidt Various forms of leadership and leader follower relations Obligations exchanges incentives coercion corruption bossism in both the U S and foreign experience

549 Comparative Political Behavior (3-0) Cr 3 Alt yr ***Prereq 305 or 405* Rasmussen Empirical analysis of political behavior in cross national perspective including activist participation level of political sophistication cleavage structures and voting role of partisan identification

***552 (452 DL) Comparative Foreign Policy** (3-0) Cr 3 Alt yr ** *Prereq 251* Kihl McCormick Various theoretical approaches to explain foreign policy making and behavior through the use of case studies of selected nations

559 International Relations Theory (3 0) Cr 3 Alt yr ***Prereq 6 credits in international studies* Kihl Mansbach McCormick Selected theoretical writings both classical and contemporary on world politics Realism war and conflict peace and cooperation political economy crisis decision making and transnational relations

560 Legislative Behavior (3-0) Cr 3 Alt yr ** *Prereq 360 or equivalent* Principles procedures and problems of the legislative process Policymaking in state legislatures and the U S Congress

561 The Chief Executive (3 0) Cr 3 Alt yr ** *Prereq 6 credits in American government* Legal and political forces influencing the U S president governors and other governmental executives in decision making developing and administering programs of government leading public opinion and influencing legislation

571 Organizational Theory in the Public Sector ** (3-0) Cr 3 *Prereq 6 credits in political science* Major theories of administrative organization including motivations of administrators and organizations comparisons of organizational arrangements factors affecting organizational arrangements and formal and informal decision making structures

572 Public Budgeting and Financial Management (3-0) Cr 3 Alt yr ** *Prereq 6 credits in political science* Koven The process of public budgeting Alternative budget systems including taxation the appropriation process program evaluation and debt and risk management at federal state and local levels

573 Public Personnel Administration (3-0) Cr 3 Alt yr ** *Prereq 6 credits in political science* Lee Recruitment retention and development of employees merit systems collective bargaining and grievance procedures

574 Methods of Policy and Program Evaluation (3-0) Cr 3 Alt yr ** *Prereq 9 credits in political science* Lee Integration application and utilization of public administration and public policy concepts in the interpretation of results and effectiveness of public programs and the prediction of consequences for policymakers and administrators Computer fee

***575 (475 DL) Management in the Public Sector** (3-0) Cr 3 Alt yr ** *Prereq 6 credits in political science* Lee Contemporary literature and research on organizational behavior and management theory with emphasis on productivity communication and information technology conflict resolution and policy planning and decision making in the public sector

***576 (476 DL) Administrative Law** (3-0) Cr 3 Alt yr ** *Prereq Graduate classification* Constitutional problems of delegation of governmental powers elements of fair administrative procedures judicial control over administrative determinations

***580 (480 DL) Ethics and Public Policy** (3-0) Cr 3 Alt yr ***Prereq 6 credits in political science* Major ethical concepts in U S political philosophy The controversy over public versus private morality in political policy making Analysis of public decision making case studies emphasis on ethical considerations Major proposals and legislation related to improving the quality of ethical criteria and decisions in public policy making

***581 (481 DL) International Political Economy** (3-0) Cr 3 Alt yr ** *Prereq 6 credits in political science* An overview of the international political economy since the end of World War II Special emphasis on national (primarily U S) development assistance and agricultural/food politics and policies and those of the international food organizations the World Bank and the regional development banks

***584 (484 DL) Rural and Small Community Development Policy** (3-0) Cr 3 Alt yr ** *Prereq Graduate classification* Major policies local governments intergovernmental relations and significant groups and coalitions active in rural and small community environments in developed countries Education poverty housing recreation health conservation and environment research and extension manpower and agriculture

590 Special Topics Cr 2 to 5 each time taken F S *Prereq 15 credits in political science written permission of instructor*
- A American Political Institutions
- B Public Law
- C Political Theory and Methodology
- D Comparative Government
- E International Relations
- F Political Parties and Policy Formation
- G Public Administration and Public Policy
- I Internship
- T Teaching Preparation

599 Creative Component

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*See page 119 for information on dual-listed courses

**Refer to the *Schedule of Classes* or consult the department office for up to-date scheduling information

***Designated repeat not permitted

Courses for Graduate Students, major or minor

610 Graduate Seminars (3 0) Cr 3 for each seminar F S *Prereq 15 credits in political science*
- A American Political Institutions
- B Public Law
- C Political Theory and Methodology
- D Comparative Government
- E International Relations
- F Policy Process
- G Public Administration and Public Policy

699 Research

Preprofessional Study

Requirements for admission to most professional academic programs can be met by study at Iowa State University These requirements may be met in the course of obtaining a bachelor s degree from Iowa State or at a level below that of a degree, depending on the intended field of study The specific courses taken in a preprofessional program will depend primarily upon the admission requirements of the professional schools to which a student wants to apply In some programs requiring three years of preprofessional work a student may by careful planning complete requirements for the bachelor s degree upon transferring to Iowa State up to 32 semester credits of professional coursework Generally these credits will be counted as electives but a maximum of 24 may be used as major credits in interdisciplinary studies and a smaller number as major credits in appropriate departments

Students who have not declared a major upon entry should enter as preprofessional students i e premedical, prelaw, PHP (preprofessional health programs) or GENPV (General Undergraduate Studies Pre Vet) until they choose a major or transfer to a professional school All students whether they have selected a major or not are

encouraged to identify their interest in a professional career by designating it on their application or by completing a preprofessional interest form during registration

Information about preprofessional program admissions requirements and career opportunities in human health or law may be obtained in the Liberal Arts and Sciences Advising Center Information about veterinary medicine admissions requirements and career opportunities may be obtained from *the coordinator of the preveterinary program* in the Office of the Dean of the College of Veterinary Medicine

Clinical Laboratory Science/Medical Technology Clinical laboratory scientists still commonly referred to as medical technologists are important members of health-care teams They perform the chemical microscopic radio-assay and microbiological tests that are necessary in disease diagnosis and they type and cross-match blood samples to facilitate blood transfusions They usually work under the supervision of a physician in a hospital or clinic laboratory but may also be employed by a pharmaceutical company or by manufacturers of analytical instruments The professional training requires 12 months in a hospital-based CLS/MT program following at least 3 years of college study that emphasizes chemistry and the biological sciences Students may earn a bachelor s degree by completing the admissions requirements of the CLS/MT program and most of the degree requirements in 3 years on campus then spending their fourth year in one of the hospital programs that are affiliated with Iowa State University A maximum of 32 semester credits earned there can be used to partially fulfill the requirements for the bachelor s degree Students who complete all degree requirements in residence at the university may apply to any school of medical *technology for which the admission* requirements have been met

The following CLS/MT programs are affiliated *with Iowa State University*

Iowa Methodist Medical Center Des Moines Iowa Program Director Linda Blair Medical *Director Richard K Scupham*

Mercy Hospital Medical Center Des Moines Iowa Program Director Marianne Samorey Medical Director *Vijaya L Dhannavada*

St Luke s Methodist Hospital Cedar Rapids Iowa Education Coordinator Nadine Sojka Medical Director Dorryl Buck

University of Iowa Hospitals Iowa City Iowa Program Director Marian Schwabbauer Medical Director James Goeken

The following courses, with variable credit are offered in the above programs

401C Medical Technology Practicum An introduction to medical technology

402C Clinical Immunology Antigen antibody structure function and interaction Principles and procedures of humoral and cellular immunology Performance and clinical correlation of serological testing Quality control

403C Clinical Chemistry Identification and quantitation of specific chemical substances in blood and body fluids by analytical methodologies Clinical correlation with disease states Principles of instrumentation Data processing Toxicology *Quality control Principles and procedures for* radioassay including data reduction methods clinical correlation and quality control

404C Clinical Immunohematology Major blood *group systems Principles and procedures for* antigen-antibody detection and identification Donor blood collection preservation and processing Component therapy Transfusion reaction evaluation Rh immunoglobulin Quality control

405C Clinical Hematology Theory of blood cell formation and disease states Hemostasis Microscopic examination of blood/bone marrow films Practical experience with instruments and techniques that determine major hematologic and coagulation parameters Quality control

406C Clinical Microbiology Theory and *techniques of cultivation isolation and identification* of bacteria fungi parasites and viruses Determination of sensitivity to antimicrobial agents Clinical correlation to disease states asepsis epidemiology Quality control

407C Urinalysis Body Fluids Microscopy Theory of renal function in health and disease Renal function tests including chemical and microscopic examination of urine Analysis of fecal specimens gastric fluid spinal fluid and other body fluids Quality control

408C Senior Seminar Laboratory management organization purchasing methods planning personnel relations Training methods Scientific writing case studies and their presentation

412C Clinical Immunology Laboratory

413C Clinical Chemistry Laboratory

414C Clinical Immunohematology Laboratory

415C Clinical Hematology Laboratory

416C Clinical Microbiology Laboratory

417C Urinalysis Body Fluids Microscopy Laboratory

Cytotechnology A cytotechnologist works in a medical laboratory preparing staining, mounting and evaluating specimens of human body tissues in order to find those cells that are abnormal The abnormal specimens are then submitted to the pathologist supervising the laboratory for *confirmation and interpretation* The training requires 12 months in a school of cytotechnology after at least 3 years of college study that includes a minimum of *20 semester credits in biological sciences* 8 semester credits in chemistry and 3 semester credits in math Certification as a cytotechnologist requires a baccalaureate degree Students may enter the professional school after earning a bachelor s degree in a related field Alternatively they may use up to 32 semester credits from an affiliated cytotechnology school in partial fulfillment of requirements for a B S degree

Currently the only school of cytotechnology in Iowa is at Mercy Hospital Medical Center in Des Moines Iowa State University is affiliated with the School of Cytotechnology of the State Laboratory of Hygiene at the University of Wisconsin-Madison The following combination lecture and laboratory courses are offered in the 12-month professional program

420C Basic Cytology and Laboratory Procedures *Cr 1 Review of cellular biology optical methods* with emphasis on light microscope and techniques for preparation and staining of specimens for cytologic and histologic study

421C Cytology of Female Genital System *Cr 1* Anatomy physiology and pathophysiology of the female genital tract and the corresponding cellular manifestations of normality inflammation atypia *neoplasia (benign and malignant)* and cellular changes due to therapy Correlation of didactic information with microscopic cellular manifestations to provide a cytologic diagnosis

422C *Cytology of Respiratory System* *Cr 2* Anatomy physiology and pathophysiology of the respiratory system and corresponding cellular manifestations that provide diagnostic information Correlation of didactic information with microscopic cellular manifestations to provide a cytologic diagnosis

423C Cytology of the Gastrointestinal and Genitourinary Systems Cr 4 Anatomy physiology and pathophysiology of the gastrointestinal and genitourinary systems and corresponding cellular manifestations that provide diagnostic information Correlation of didactic information with microscopic cellular manifestations to provide a cytologic diagnosis

424C Cytology of Effusions Miscellaneous Fluids and Breast Cr 4 Anatomy physiology and pathophysiology of the body cavities central nervous system oral cavity skin and breast Corresponding cellular manifestations that provide diagnostic information Correlations of didactic information with microscopic cellular manifestations to provide a cytologic diagnosis

425C Advanced Laboratory Procedures Cr 2 Preparation of non gynecologic cytology specimens preparation of cytologic stains and solutions and an introduction to histologic preparatory techniques and special stains Students rotate through all phases of diagnostic service work and laboratory functions

426C Fine Needle Aspiration Cytology Cr 3 Fine needle aspiration material from bone breast liver lung lymph nodes pancreas thyroid and masses in *the transabdominal cavity for correct cytopathologic* diagnoses

427C Laboratory Management and Quality Control Cr 3 Basic administrative functions *planning organizing supervising and controlling* business management record keeping data processing and laboratory safety Quality control procedures necessary for obtaining processing diagnosing and reporting cytologic specimens

428C Special Studies (Hematology and Cytogenetics) Cr 1 Normal benign and malignant disease conditions of the hematopoietic system The basic concepts of cytogenetics analysis of buccal smears and karyotyping of normal cells and those with structural aberrations

429C Applied Cytology Cr 4 Rotation through all *phases of diagnostic service work* and laboratory functions Microscopic examination of routine specimens

Dental Hygiene A dental hygienist screens dental patients for oral defects performs clinical procedures such as cleaning teeth and may participate in oral health *education programs* Most work with dentists in private practice but some have positions in public health centers and schools Certification as a dental hygienist requires *2 years in a professional program of study* Admissions requirements for these programs vary A student may study for 2 years at Iowa State University and then transfer to an institution that *grants the bachelor s degree* in dental hygiene Alternatively a student may earn a bachelor s degree in another field at Iowa State before entering a professional program

Dentistry Dentists diagnose treat and try to prevent diseases and injuries of the teeth jaws and mouth Usually a general practitioner will have spent 3 or 4 years taking preprofessional courses at the undergraduate level and 4 years in dental school earning the degree of doctor of dental surgery (D D S) or doctor of dental medicine (D M D) Learning a specialty requires at least 2 more years The courses necessary for admission to most dental schools include English biology general and organic chemistry, and physics Students may earn a degree in any major that Iowa State University offers as they meet the admission requirements they should choose their major to reflect their own interests and abilities Highly qualified students may be accepted into dental school after 3 years of preprofessional study without earning a baccalaureate degree

Health Information Management Health information managers serve as supervisors of medical records departments in hospitals clinics nursing homes and other health-care institutions To be certified as registered record administrators (R R A) they must have completed a program leading to a bachelor s degree in medical record science Most professional programs are 2 years in length and follow 2 years of college study in chemistry biology the humanities social sciences languages and philosophy Students may take the preprofessional courses at Iowa State University and then transfer to a university offering the professional program or they may earn a bachelor s degree at Iowa State University before entering a health information management program

Hospital and Health Administration Administrators of health care organizations manage and guide the varied activities in hospitals clinics nursing homes and mental health facilities The professional requirement may be for a master s degree or a bachelor s degree depending upon the size of the institution and whether an upper or middle entry-level position is desired Students at Iowa State may take general education courses for two or more years and then transfer to a university offering a bachelor s degree in health administration or they may spend four years earning a bachelor s degree in any department before entering a master s degree program at the University of Iowa or other university Courses required for admission to master s degree programs in hospital and health administration vary but may include introductory accounting management statistics, and economics

Human Medicine Physicians study diagnose and treat illness and injury They may work in offices clinics hospitals, or laboratories in private practice or for government or industry Their professional training usually consists of 4 years of study in a college of medicine to earn the doctor of medicine (M D) degree and then 3 or more years in hospital residency learning a specialty such as family medicine pediatrics surgery obstetrics or psychiatry A degree of doctor of osteopathy (D O) is awarded to those students who complete 4 years in a college of osteopathic medicine before their residency All medical schools recommend a broad preprofessional education that includes courses in biology chemistry physics mathematics English and the social sciences arts and humanities Although many medical schools admit a small number of exceptionally well-qualified applicants after 3 years of preprofessional study most students earn a bachelor s degree while taking the courses required for admission to medical school This degree can be from any college and in any curriculum or major offered by the university The major should reflect the student s interests so that it can provide the basis for either an avocation or an alternate career

Law A lawyer assists the legal peaceful resolution of conflicts in many different ways Most lawyers are engaged in private practice but many are employed by government agencies and private business At least 3 years are needed to complete a law school program leading to a doctor of jurisprudence (J D) or a bachelor of laws (LL B) degree and a bachelor s degree is required for admission to nearly all law schools A student planning to enter law school may major in any field The courses taken should develop skill in creative thinking comprehension and expression of ideas and understanding of human institutions and values Perhaps most valuable are courses in English language and literature government economics history mathematics, Latin logic and scientific method and philosophy

Library and Information Science Librarians are essential in educational institutions medical facilities government agencies industries and public information centers The professional preparation for library administration is provided by master s degree programs Admission requirements for the University of Iowa s program for example include a bachelor s degree with at least 85 semester credits in the arts and humanities and the natural and social sciences Iowa State students may choose majors that reflect their own interests and that may provide a foundation for working in medical law or other specialized libraries

Nuclear Medicine Technology The use of radioactive chemicals in the diagnosis and treatment of disease is the distinguishing feature of nuclear medicine Under the supervision of a physician in a hospital or clinic the technologist prepares and administers these radiochemical tracers uses sophisticated detectors and computers to trace the movement and localization of the tracers in the human body and analyzes biological specimens to determine levels of hormones drugs and other chemicals in the body One year in a training program such as that at the University of Iowa College of Medicine is required to become a certified nuclear medicine technologist (C N M T) Admission to this program requires at least 94 semester credits of preprofessional coursework in chemistry physics zoology English mathematics computer science statistics the social sciences and humanities Students at Iowa State University can transfer to a university offering a nuclear medicine technology program after 2 or 3 years of preprofessional courses and then receive the bachelor's degree at that institution Alternatively the student may earn a bachelor s degree before entering the 1-year professional program or may spend 3 years at Iowa State University meeting the admissions requirements of the program and completing requirements for a B S degree using a maximum of 32 semester credits that may be transferred to Iowa State University from the professional school

Nursing A professional nurse may do clinical nursing teaching or research in hospitals private practice public health centers, schools or industry Although becoming a registered nurse (R N) does not require a bachelor s degree the student who completes the bachelor of science degree in nursing (B S N) has college-level preparation for clinical nursing and an essential base for graduate study Iowa State University does not offer a nursing degree but does participate in a transfer program with the University of Iowa and Grand View College in Des Moines Students take specified courses for 2 years at Iowa State University and if accepted in the University of Iowa College of Nursing complete the B S N requirements and the R N examination in another 2½ years If accepted at Grand View College they may complete the B S N requirements and take the R N examinations in 2 years Students may also elect to transfer to a B S N program at another college or university Most of these programs require a minimum of 3 years of resident study but their requirements vary so that early planning for transfer is essential

Occupational Therapy Occupational therapists provide purposeful activities to help those who have been disabled by physical illness or injury birth defects emotional disorder aging drug abuse or other problems to learn to cope with everyday living Therapists treat patients in hospitals school systems and rehabilitation centers Students may elect one of three paths to certification as registered occupational therapists (O T R) They may complete a bachelor s degree in a related area at Iowa State University and then enter a certification or master s degree program at another university they may complete 1 or 2 years of preoccupational therapy courses at Iowa State and then transfer to another university to complete the requirements for a bachelor s degree in occupational therapy or they may participate in a cooperative 3-2 program with Washington University School of Medicine in St Louis Missouri In this program the student spends 3 years at Iowa State University meeting the requirements for a bachelor s degree except for 30 semester credits that can be transferred back from the first year at Washington University Completion of the second year will lead to a bachelor of science degree or a master s degree in occupational therapy from Washington University The prerequisites for admission to an occupational therapy program usually include English art biology chemistry physics psychology sociology anthropology and statistics but vary from one school to another

Optometry An optometrist detects and corrects abnormal vision without the use of drugs or surgery prescribes corrective lenses or vision therapy and detects evidence of eye disease requiring referral to physicians Optometrists usually set up their own offices or work in group practice Professional study requires 4 years in a school or college of optometry and leads to the doctor of

optometry (O D) degree A few schools will admit students after 2 years of preprofessional education most optometry schools require at least 90 semester credits of preprofessional courses including biology chemistry physics mathematics and English Students wishing to earn the bachelor s degree from Iowa State University may choose any major and take the courses required for graduation with that major as they take the courses required for admission to a professional optometry program Alternatively students may take only courses required for admission to the professional school without earning a bachelor s degree

Pharmacy *Pharmacists prepare and* dispense medicinal products and are trained to identify analyze and select medicines and inform others about their use They practice in private businesses hospitals government agencies and industry A bachelor of science degree in pharmacy requires a total of 5 years of college education Students may take either 1 or 2 years of courses in chemistry biology mathematics economics the social sciences and humanities at Iowa State University before transferring to a college of pharmacy elsewhere for 3 or 4 years of professional study

Physical Therapy Physical therapists work with people who have been disabled by injury illness or birth defects They assist in evaluating the physical problems and administer therapeutic agents such as massage and exercise heat baths ultrasonics and electricity they work in hospitals clinics nursing homes, schools, rehabilitation centers and private practice There are three paths to certification as a physical therapist Students may transfer after 1 or 2 years at Iowa State University to a college or university offering physical therapy as a bachelor s degree program More often *students earn a bachelor s degree in a related* field at Iowa State University before spending 2 years in a professional school to earn a certificate or a master s degree A three-year doctoral (DPT) program at Creighton University also provides entry-level training Courses required for admission to a professional program include biology chemistry physics psychology mathematics and statistics

Physician Assistant A physician assistant provides medical services under the supervision of a licensed physician frequently in a rural or inner-city clinic The responsibilities may include taking patients histories physical examinations prescription of laboratory studies diagnosis and treatment of common problems follow-up care and counseling Certification as a physician assistant requires 2 years in a professional program at the master s or bachelor s degree level Students applying to a bachelor s degree program must have completed at least 60 semester credits of college work including general and organic chemistry zoology behavioral science and humanities Mathematics and physics courses are recommended and applicants who have had *health-care experience* with direct patient contact are preferred Admission to a master s degree program requires similar coursework and experience in addition to a bachelor's degree in zoology or a related field

Podiatry Podiatrists diagnose, treat and try to prevent diseases and disorders of the human foot and ankle They treat patients in private and group practice hospitals, and increasingly in industrial and sports-related positions Professional training requires 4 years in a college of podiatric medicine and leads to the degree of doctor of podiatric medicine (D P M) This is usually followed by 1 to 3 years in a hospital residency All podiatric colleges require at least 3 years of preprofessional study including courses in biology general and organic chemistry physics and English Most entrants have a bachelor s degree which may be in any major A few students may complete the *admission requirements and most of the* bachelor s degree requirements in 3 years If so a maximum of 32 semester credits may be transferred to Iowa State University from the first year in an accredited podiatric college in order to complete the requirements for the bachelor s degree

Speech-Language Pathology and Audiology Specialists in communication disorders help with the diagnosis and correction of speech language and hearing problems working usually in clinics hospitals or schools A certificate of clinical competence in speech-language pathology or audiology requires a master s degree for which a student must study at another university Preparation for graduate work should include study of the normal processes of speech learning and language in courses such as Introduction to Communication Disorders Phonetics Speech and Hearing Mechanism Psychology of Language Language Development Speech and Hearing Science Statistics Introduction to Psychology The Physics of Sound and at least one biology or zoology course Supervised clinical observation is advantageous Further coursework may *emphasize psychology or child development* but requirements for admission to the professional programs will vary from one to another More information is available in the Department of Speech Communication

Theology The professional education of a student of religion usually requires 3 years in a program leading to the master of divinity (M Div) offered at a school of divinity or of theology *These schools require a bachelor s* degree for admission The American Association of Theological Schools recommends the following areas of study as the best preparation for theological studies English language and literature history including non-Western culture philosophy natural sciences social sciences especially psychology sociology and anthropology the fine arts Biblical and modern languages and religion both Western and Eastern Although students in a variety of major fields may qualify for admission to a theological school interested persons are advised to review their proposed programs with a representative of the Department of Philosophy or of the Religious Studies Program

Veterinary Medicine About 75% of all veterinarians are engaged in private practice In a mixed practice they diagnose and treat health problems among a variety of animals Others specialize in one species (e g feline pet bird) and still others specialize in a specific discipline within veterinary medicine (e g cardiology, ophthalmology) Veterinarians may also choose public practice (e g public health education research food safety industry laboratory animal medicine aquatic animal medicine poultry medicine and military veterinary medicine)

The professional program requires four years at a college of veterinary medicine and leads to the doctor of veterinary medicine degree (D V M) Admission to a veterinary college involves at least two years of preprofessional college education Candidates must take courses in biology chemistry physics, English humanities and social sciences (For Iowa State University see *Veterinary Medicine Admission Requirements)*

Students may pursue their preveterinary preparation in any college at Iowa State University A major (preveterinary medicine is not a major) should be selected that is allied to each student s vocational interests in veterinary medicine or that otherwise offers vocational satisfaction in the event that plans for entry into the College of Veterinary Medicine change Students are encouraged to pursue a bachelor s degree the most effective progress toward a bachelor s degree is made when a major is selected upon entry and no change occurs before graduation However students who have not even considered a career other than veterinary medicine may need some time to explore possibilities before selection of a major

To assist students who have indicated interest in the preveterinary program for the College of Veterinary Medicine and are undecided about a major an advising category is available known as GENPV (General Undergraduate Studies Pre Vet) Orientation and advising services for these students are designed to help students fulfill preveterinary course requirements to introduce available majors and careers allied to veterinary medicine and to introduce career options in veterinary medicine GENPV students must select a major by the end of their second semester Some Iowa State University majors allow by careful planning the opportunity for a student to earn the bachelor s degree by combining credits from three years of preprofessional study and one *year of profesional study in the College of* Veterinary Medicine

Professional Agriculture

(Interdepartmental Program)

Undergraduate Study

Supervisory Committee T E Loynachan Chair P A Domoto W M Edwards D W Mangold J A Sandor B R Skaar

Through the College of Agriculture Iowa State University offers the bachelor of science degree in professional agriculture designed specifically for those students who choose to study away from the Ames campus Many students take a portion of their coursework from colleges in close proximity to their home and transfer the credit to ISU The agricultural coursework (a minimum of 45 credits) is a well-rounded mix of agricultural topics delivered via video-tapes satellite transmissions off-campus site

classes and on-campus workshops and laboratories For curriculum detail see *Professional Agriculture College of Agriculture Curricula*

Graduate Study

Supervisory Committee R Martin Chair V Bekkum P Brackelsberg A Campbell A Hallam

The graduate major in professional agriculture is an off-campus program leading to the degree master of agriculture It is available to students who wish to pursue graduate study in agriculture away from the Ames campus The program is considered to be a professional master s degree and not preparation for further graduate study Those who major in professional agriculture are required to take a minimum of two courses in each of three disciplines complete 24 semester credits of formal course work 4 semester credits for a creative component and 4 semester credits of workshops Core courses are offered in agricultural systems technology (agricultural mechanization) agronomy animal science economics, and horticulture Additional agricultural disciplines are also offered Courses are delivered via video-tapes satellite transmissions off-campus site classes and on-campus workshops Specific courses offered in the program and the location of the off-campus classes may be obtained from the departmental course listings off-campus course catalog or by contacting the Professional Agriculture Curriculum Office 20 Curtiss Hall

As mentioned above a minimum of 4 credits of creative component experience is required A thesis option is not available The creative component is a demonstration of independent creativity with a written report of laboratory field or library research acceptable to the student s program of study committee Four credits of workshops are required including a workshop in applied statistics Two of the workshops must be taken on campus

The program of study committee in consultation with the student determines the courses to be taken and the acceptability of transfer credits and on-campus coursework The major professor should be selected from the discipline where a concentration of coursework will be taken

Students who wish to pursue this off-campus major must meet the same admission requirements as other students seeking admission to graduate study

For additional information students should contact the Professional Agriculture Curriculum Office 20 Curtiss Hall ISU Ames Iowa 50011

Professional Studies in Education

Norman Boyles Interim Chair of Department

Professors Barak, Boyles Ebbers Fanslow Hopper, Huba Littrell Manatt Miller Netusil Pellegreno Reschly Robinson Jim Sweeney Wilson

Emeritus Professors Ahmann, Beavers Bryan Engel Holmes Jones Kizer Lagomarcino, Lawrence

Associate Professors Owen Poston Railsback Stow Thielen

Assistant Professors Anderson Jackson Kruempel Licklider Mitchell Snyder Stanley Jan Sweeney Whitt

Graduate Study

The Departments of Professional Studies in Education and Curriculum and Instruction offer work for the degrees master of science master of education and doctor of philosophy with a major in education and minor work to students taking major work in other departments Within the education major in the Department of Professional Studies in Education a student may specialize in adult and extension education counselor education (master s only) educational administration higher education historical philosophical and comparative studies in education (master's only) research and evaluation (master s only) and vocational education (master of education only) See the Department of Curriculum and Instruction for further discussion of the education major with specialization in elementary education, special education and curriculum and instructional technology

Prerequisite to major graduate work in education is preparation substantially equivalent to the completion of one of the undergraduate curricula in education offered at Iowa State University or graduate preparation in a discipline to be used as a teaching field in a community college or university and adequate proof that the student ranks above average in scholastic ability and promise of professional competence

Students may choose an area of specialization for study Two areas may be selected by those who have the requisite background Such students must successfully complete the program requirements of both areas in order to receive a graduate degree

The foreign language requirement if any for the Ph D degree will be determined by the student s program of study committee If no foreign language is required the total program must consist of a minimum of 78 semester credits at least 12 of which must be earned outside the education major and at least 16 of which must be earned outside the area of specialization Statistics and research methods may not be included in the 16 credits Should foreign language be included the program of study committee may adjust the minimum program requirement downward but in no instance may the program of study be less than 72 semester credits Students whose native language is not English may substitute competence in English

Other graduate programs related to education (including General Graduate Studies) may be planned for students on the basis of previous education and experiences as well as future plans and needs Students should refer to *Agricultural Education and Studies Curriculum and Instruction Family and Consumer Sciences Education and Studies Health and Human Performance Industrial Education and Technology Professional Studies in Education* and *General Graduate Studies* or to graduate level course offerings within other departments

The department participates in the interdepartmental programs of gerontology housing and technology and social change

Adult and Extension Education (Ad Ed)

John P Wilson Section Leader

The adult and extension education program prepares professionals to work in the expanding area of learning activities for adults such as teaching training and development and continuing education Students applying for admission are asked to submit a statement of objectives for pursuing a graduate degree in adult and extension education Three degrees are offered (1) the master of education—designed for the practitioner the degree requires a creative component rather than a thesis (2) the master of science—a research oriented degree designed for the individual who plans to continue in graduate studies (3) the doctor of philosophy—a research oriented degree Although the doctor of philosophy is research oriented an individual who intends to work in adult programming or administration may design a program which blends research skills with programming and administrative skills

Course for minor graduate credit only

469 Introduction to Adult and Extension Education (3 0) Cr 3 F *Prereq 9 credits in education or related areas* An overview of adult and extension education its development organization objectives programs and procedures Designed for prospective extension agents and other adult educators

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

536 Foundations of Adult Education (3-0) Cr 3 F *Prereq 9 credits in education* A study of the modern practice of adult education from the perspective of its history philosophy agencies and literature

537 Instruction of Adult Learners (3-0) Cr 3 S *Prereq 469 or 536* Instruction and learning theory methods and techniques Development of varied approaches for teaching adults

538 Community and Adult Education (3 0) Cr 3 S *Prereq 536* Application and procedures adult educators utilize in the development of community based education programs Community education concepts community needs resources leadership and services

539 Program Development in Adult and Extension Education (3 0) Cr 3 F *Prereq 536* Principles models and evaluation of program planning including long range and strategic planning processes

590 Special Topics Cr 1 to 6 *Prereq 6 credits in adult and extension education*

591 Practicum/Internship Cr 1 to 6 *Prereq 9 credits graduate work in adult and extension education* Practicum or internship designed for work exposure in adult and extension education Examples include continuing education centers community colleges extension offices training divisions

593 Workshop Cr 1 to 3 *Prereq 536* Workshops designed to provide intensive concentrated and experience-oriented exposure to a special adult and extension education topic

595 Colloquium in Adult and Extension Education Cr 1 to 3 *Prereq 6 credits in education* Offered when demand warrants and faculty are available
A Adult Basic Education
B Adult Counseling
C Educational Gerontology
D Dynamics of Instructional Groups
E International Adult Education
F Adult Training in Life/Career Planning
G Nontraditional Education
H Philosophy of Adult Education
I Training Skills
J Organization and Administration of Adult and Extension Education
K Historical Perspectives of Adult Education

599 Creative Component Cr 1 to 3 *Prereq 9 credits in adult and extension education*

Courses for Graduate Students, major or minor

601 Theory Building in Adult Education (3 0) Cr 3 F *Prereq 536 537 539* Examination of the nature and development of theories in adult education

615 Seminar Cr 1 to 3 F S SS *Prereq 9 credits in adult and extension education* Group study and discussion on student and staff research in adult and extension education or special topic focus as needed by students

690 Advanced Special Topics Cr 1 to 6 *Prereq 9 credits in adult and extension education*

699 Research Cr arr F S SS *Prereq 9 credits in adult and extension education permission of instructor*

Counselor Education (Co Ed)

John M Littrell Section Leader

The counselor education program places a dual emphasis on the development of professional counselors and on the academic/scholarly aspects of the counseling profession Students are provided an opportunity for practical experience in a variety of settings

Students desiring graduate work in counselor education leading to the master of science degree may elect one of three programs elementary school counseling secondary school counseling or community counseling

Courses Primarily for Graduate Students, major or minor, open to *qualified undergraduates*

529 Foundations of Counseling (2-2) Cr 2 F SS *Prereq 8 credits in undergraduate education sociology or psychology* Research theory and conditions that facilitate behavioral change in individuals Professional roles and functions professional organizations and associations professional history and trends ethical standards and legal issues professional preparation standards and professional credentials

531 Microcounseling (1-2) Cr 2 F S SS *Prereq Credit or enrollment in 529* Building skills in listening responding and developing counseling relationships

532 Guidance in the Elementary School (2-0) Cr 2 F Alt SS offered 1995 *Prereq 8 credits undergraduate education sociology or psychology* Introduction to current counseling coordinating and consulting practices as they relate to students parents and professionals in the elementary school

534 Management of Counseling Services (2-0) Cr 2 S Alt SS offered 1995 *Prereq 529* Defining delivering scheduling and evaluating counseling services Leadership styles public relations identifying and working within the school and community power structure to establish and redefine program objectives and methods of ascertaining whether objectives are being met

540 The Client as a Person (2-0) Cr 2 F Alt SS offered 1994 *Prereq 529* Information about clients as a basis for understanding and providing assistance Views of a client as a person include hassles transitions crises developmental concerns or such situations as loss addiction or intimacy

551 Occupational Choice and Development (3-0) Cr 3 S Alt SS offered 1994 *Prereq 529* Developmental and social factors influencing career choice Theories assessment instruments classification systems and informational sources used in career counseling

560 Counseling Theories (2-0) Cr 2 F SS *Prereq 529* How counseling theory aids counselors in conceptualizing client concerns and facilitating client choice and/or behavioral change

561 Counseling Techniques Adolescent and Young Adult (1 2) Cr 2 S Alt SS offered 1995 *Prereq Credit or concurrent enrollment in 531* A multimodal approach to planning counseling interventions The laboratory provides students an opportunity to evaluate the appropriateness of interventions and to practice implementation

565 Counseling Techniques Preadolescents (2-0) Cr 2 S *Prereq Credit or enrollment in 560* Applied use of role playing fantasy classroom groups relaxation and other specific techniques that can be utilized as a means for assisting the preadolescent with self understanding problem solving and other developmental concerns

569 Leading and Processing Counseling Groups (2-2) Cr 3 F Alt SS offered 1994 *Prereq 560* Ethics for group leaders planning implementing and facilitating groups Dynamics and leader interventions at various group stages Participation in group laboratory activities

578 Cross Cultural Issues in Counseling (2-0) Cr 2 F Alt S offered 1994 *Prereq 529 560 and 561 or 565* Value biases of counseling theories techniques and counselors that create barriers to successful service delivery to culturally different persons Modification of counseling skills and strategies for the culturally different clients

580 Practicum in Community Counseling Cr 3 F S *Prereq 561 or 565* Designed for students who desire counseling experience in a community/agency setting Practicum experience can be arranged at urban centers detention facilities MDTA centers vocational rehabilitation centers etc

581 Practicum in Secondary School Counseling Cr 3 F S *Prereq 561* Placement in a secondary and/or junior high school The practicum student will perform various role functions expected of the school counselor Emphasis on individual and group counseling functions

582 Practicum in Elementary School Counseling Cr 3 F S *Prereq 565* Placement in an elementary school Counseling students consulting with teachers and parents and coordinating activities that enhance student development and growth both in the cognitive and affective domains

590 Special Topics Cr 1 to 2 *Prereq 10 graduate hours in counselor education*

593 Workshop in Counseling and Guidance Cr 1 to 3 SS *Prereq 10 hours in counselor education* Workshops are designed to give practicing counselors an in-depth exposure to a counseling model with concurrent opportunity for application of the model Offered when demand warrants
A Adlerian Therapy
B Behavioral Therapy
C Brief Therapy
D Substance Abuse Counseling
E Psychodrama
F Family Consultation
G Gestalt
H Crisis Intervention
I Theoretical Issues

599 Creative Component Cr 1 to 2 *Prereq 10 credits in counselor education*

Courses for Graduate Students, major or minor

610 Group Counseling Practicum Cr 1 F S SS *Prereq 580 or 581 or 582 and permission of instructor* Supervised experience facilitating and processing groups
A Skill Training Lab
B Counseling Group

611 Internship Cr 3 to 6 F S *Prereq 580 or 581 or 582* A student intern performs all activities that regularly employed staff members in a counseling setting perform

615 Seminar Cr 1 to 2 *Prereq 10 hours in counselor education* Seminars are designed to meet various needs of advanced master s students and practicing counselors Offered when demand warrants
A Adlerian Counseling
B Behavioral Counseling
C Current Issues and Trends in Counseling
D Family Consultation
E Gestalt Theory and Procedures
F Group Intervention Strategies
G Structure of Change

620 Supervision of Counseling Cr 2 F S *Prereq Minimum of 3 practicum credits and permission of instructor* Advanced counseling students provide clinical supervision for students enrolled in 580 581 and/or 582

690 Advanced Special Topics Cr arr *Prereq 10 credits in counselor education*

699 Research Cr arr *Prereq 10 credits in counselor education*

Educational Administration (Ed Adm)

William K Poston Jr Section Leader

The educational administration program places dual emphasis on preparation of professional educational administrators and on the academic/scholarly aspects of educational leadership and management

Several programs are offered (1) the master of science degree both thesis and nonthesis in elementary or secondary school administration (2) advanced study leading to superintendency licensure and (3) the doctor of philosophy degree

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

541 Principles of Educational Administration (2-0) Cr 2 F SS *Prereq Teacher licensure* Licklider Poston Purposes of education in a democratic society Basic principles of school administration Analysis of the nature and function of units of education at local intermediate and state levels exploration of substantive elements such as school finance legal aspects etc

543 The Administration of School Personnel I (3-0) Cr 3 S SS *Prereq 9 credits in education* Mitchell Group dynamics selection and deployment of the teaching and administrative staff employee involvement e g Quality Circles experiences in interviewing staff development

546 School Business Management (2-0) Cr 2 SS *Prereq 541* Poston Functions and duties of the school business manager school plant planning financial management and banking investment of funds risk management cash flow projections accounting practices food services transportation purchasing managing the business office fiscal information systems

547 School Public Relations (2 0) Cr 2 F SS *Prereq 541* Boyles Licklider Planning and executing a successful school public relations program roles and responsibilities in the public relations program internal and external public relations influences public relations vs communications

548 Policy Development and Issues School Board and Superintendent Roles (2-0) Cr 2 S SS *Prereq 541* Manatt Poston Functions of the superintendent and school board in policy making problems of interpreting and implementing policy Power structure in the community and its relationship to the functions of the superintendent and school board

549 School Related Strategic Operational, and Facility Planning (2-0) Cr 2 F *Prereq 541* Poston Belief systems external and internal scanning missions visioning strategic goals objectives tactics action plans planning tools school plant planning

555 The Organization and Administration of Schools for the Adolescent (2-0) Cr 2 *Prereq 541* Licklider Operation of schools for adolescents Adolescent learners their curricular needs and how to organize and manage the total school program for them

557 Supervision of Instruction (3 0) Cr 3 F SS *Prereq 541* Manatt Mitchell Evaluating and improving the performance of teachers and administrators of K-12 public and independent schools intermediate educational units and community colleges This offering meets the requirement for evaluator training necessary for licensure in Iowa

575 Fundamentals of School Law (3 0) Cr 3 S SS *Prereq 541 543* Staff Constitutional statutory and judicial provisions as a basis for the legal operation of public schools The law is examined as it affects the local school district boards of education administrators teachers and students at the elementary and secondary school levels

576 The Administration of Elementary Schools (3-0) Cr 3 S SS *Prereq Curr 541* Railsback Patterns of elementary school organization educational leadership through supervision curriculum development and in service education Administering pupil and auxiliary services staff and community relations

577 The Administration of Secondary Schools (3-0) Cr 3 S SS *Prereq 541* Mitchell Sweeney Secondary school organization schedule making management of pupil organizations evaluation of pupil growth Evaluation of the total program staff utilization and leadership

578 Administrative Theory in Education (3-0) Cr 3 F *Prereq 541* Sweeney Current thinking in administration and organization theoretical approaches to administration analysis of functions and processes of administration as they apply to education

580 Administration of Special Education Problems and Practices (3-0) Cr 3 F *Prereq 541* Railsback Administration of special education programs Current problems and practices of special education exceptional child and individualized educational program administration

581 Current Practices of the Superintendency (3-0) Cr 3 S *Prereq 591* Manatt Poston Examination of current practices and tasks of the superintendent via seminar-type interaction with superintendents and other practitioners

590 Special Topics Cr 1 to 4 *Prereq 9 credits in education*

591 Supervised Field Experience Cr 1 to 6 *Prereq 15 credits graduate work in special areas* Supervised on-the job field experience in special areas
- A Elementary Principal Railsback
- B Secondary Principal Licklider
- C Superintendent Poston

593 Workshops Cr 1 to 4 *Prereq 9 credits in education*

599 Creative Component Cr 1 to 3 *Prereq 9 credits in educational administration*

Courses for Graduate Students, major or minor

615 Seminar Cr 1 to 3

641 Administrative Problems (3-0) Cr 3 F *Prereq 541* Poston Anderson A case study approach to the resolution of problems in educational administration Emphasis on decision-making conflict resolution and communication using actual situations

643 The Administration of School Personnel II (2-0) Cr 2 S *Prereq 543* Poston Collective bargaining in the public sector master contract analysis negotiation simulations selected topics such as contract administration compensation management and organizational dimensions

644 School Finance (2-0) Cr 2 S *Prereq 541* Poston Current issues in school finance tax structures multiple state aid models federal financial aid programs Iowa s finance model developing communicating and monitoring a school district budget bond issues tax anticipation and bond anticipation notes the economic and political context of school finance

657 Advanced Supervision of Instruction (2-0) Cr 2 F *Prereq 557* Manatt Theory strategies and systems for supervising programs and personnel in school districts and independent schools Focuses on the principal cabinet level administrator e g director headmaster or assistant superintendent for instruction

676 Instructional Management (2-0) Cr 2 *Prereq 576 or 577* Railsback Techniques for managing the instructional program according to the theory and principles of outcomes based instruction Designing delivering and monitoring techniques

679 Contemporary Management Strategies (2-0) Cr 2 S *Prereq 578* Sweeney Critical analysis of major research in management systems communication theory and group facilitation as it applies to the management of educational and other public institutions staff development techniques and theories individual group and organizational development strategies

690 Advanced Special Topics Cr 1 to 3 *Prereq 9 credits in educational administration*

699 Research Cr arr *Prereq 9 credits in education*

Higher Education (Hg Ed)

Daniel C Robinson Section Leader

The higher education program provides graduate instruction and leadership development in community college education student and personnel services institutional research post-secondary curriculum and higher education administration The master of science and doctor of philosophy degrees are offered as well as postgraduate professional development and community college licensure courses Students desiring community college licensure must have a master s degree in a subject matter area and complete the following courses Hg Ed 561, 562, and 582 Contact the section leader for additional information

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Higher Education and Student Personnel Services (1-0) Cr 1 F *Prereq Admission to the master s program in professional studies (higher education) and permission of instructor* Ebbers Robinson For master s degree students Primary literature in higher education resources careers professional organizations and programs Particular emphasis on student personnel services

504 Higher Education in the United States (2 0) Cr 2 F SS *Prereq Graduate standing* Kruempel Whitt Historical development diversity functions and philosophies of colleges and universities federal and state roles general liberal technical graduate and professional education

561 College Teaching (2-0) Cr 2 F *Prereq 6 graduate credits* Ebbers Educational theory methods and strategies for the improvement of college instruction Significance of adult learning styles academic disciplines and teaching styles in relation to college instruction

562 Curriculum Development in Colleges (3 0) Cr 3 S *Prereq 504* Kruempel Whitt Modes of curriculum design development and change in colleges Development of curricular leadership and evaluation strategies

563 College Personnel Policies and Practices (3-0) Cr 3 Alt F offered 1993 *Prereq 504* Ebbers Robinson Personnel management and problems in service development salaries and fringe benefits promotions tenure retirement and recruitment practices Faculty organizations and collective bargaining

568 Global Education Policy Analysis (3 0) Cr 3 F *Prereq 504* Assessment of global education policy issues in education Analysis of policies implementation strategies and policy outcomes

570 Current Topics in Student Affairs Cr 1 to 3 SS *Prereq Graduate classification* Ebbers Jackson Robinson Thielen Whitt Current issues and new directions in student personnel services Topics developed to the specific needs of student affairs professionals Primarily for off campus
- A Student Outcomes Assessment and Evaluation
- B Admissions and Financial Aids
- C Advising
- D Residential Life
- E Student Organizations and Activities
- F Career Planning and Placement

574 Student Personnel Services in Higher Education (3-0) Cr 3 F SS *Prereq Credit or enrollment in 504* Ebbers Robinson An introduction to the field of student personnel work with a consideration of student activities counseling services financial aids admissions student conduct academic advising and residential programs includes community college programs

575 Organization and Administration of Student Personnel Services (2 0) Cr 2 S *Prereq 574* Thielen Organization structures role and function of student personnel staff policies and decision-making for student personnel services

576 Student Development in Higher Education (3-0) Cr 3 S *Prereq 574* Ebbers Robinson Whitt The student development approach to student personnel work Theories of student development and their applications in student personnel programs services and activities Implications of developmental theories in reference to current student issues such as career planning academic programs and moral development

580 Current Topics in Community Colleges (1 3) Cr 1 to 3 *Prereq Graduate classification* Ebbers Robinson Sweeney Current issues and new directions in community college education Topics developed to the specific needs of colleges For off campus
- A Student Needs
- B General and Liberal Education
- D Adult and Continuing Education
- E Development and Remedial Education
- F Student Services
- G Faculty and Staff Evaluation
- H Organization and Administration

582 The Comprehensive Community College (3-0) Cr 3 SS *Prereq Graduate classification* Ebbers Robinson Sweeney The community college as a unique social and educational institution its history philosophy functions programs faculty and student characteristics organization and finance trends and issues Reviews current research and exemplary community college practices internationally nationally and in Iowa

590 Special Topics Cr 1 to 4 *Prereq 9 credits in education*
A Student Services
B Community Colleges
C Current Issues
D International Higher Education
E Federal and State Affairs
F Law in Higher Education
G Institutional Research

591 Supervised Field Experience Cr 1 to 4 *Prereq 10 credits graduate work in special area* Supervised on the job field experience in special areas

593 Workshops Cr 1 to 5 *Prereq 15 credits in education*

599 Creative Component Cr arr *Prereq 9 credits in education*

Courses for Graduate Students, major or minor

602 Higher Education as a Field of Study (2-0) Cr 2 F SS *Prereq Admission to the doctoral program in higher education and permission of instructor* Robinson Whitt The central questions and schools of research related to public and administrative policy faculty careers and student life appropriate inquiry paradigms academic programs of higher education and professional organizations

615 Seminars in Higher Education Cr 1 to 4 F S SS
A Student Services
B Community Colleges
C Current Issues
D International Higher Education
E Federal and State Affairs
F Law in Higher Education
G Institutional Research
H Research Designs in Higher Education

664 College Organization and Administration (2 0) Cr 2 SS *Prereq 504* Barak Robinson Stanley Whitt Administrative organization and behavior communications leadership distribution of power and institutional governance

665 Financing Higher Education (2 0) Cr 2 Alt S offered 1994 *Prereq 504* Ebbers Sweeney Lectures discussions and individual investigation relating to financial administration in colleges and universities Budgeting space utilization administration of sponsored research fund raising investments examination of theories on expenditures Designed for persons aspiring to college administration

690 Advanced Special Topics Cr 1 to 4 *Prereq 9 credits in education*

699 Research Cr arr *Prereq 9 credits in education*

Historical, Philosophical, and Comparative Studies in Education (HPC Ed)

Section Leader

This program provides graduate experiences in historical philosophical and comparative studies in education helping students to develop facility in analyzing educational problems and issues

Work is offered toward the master of science with thesis or nonthesis option and the master of education These degree programs and classes are of benefit to classroom teachers educational theorists administrators university personnel youth workers religious educators and others who seek to understand better the numerous bases of contemporary systems of education Study in this field also complements work in other areas of specialization in education

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

580 Qualitative Research Techniques (2 or 3-0) *Cr 2 or 3 S SS Prereq ResEv 550 Kniker Whitt* Qualitative research procedures in education particularly historical philosophical biographical ethnographic and case study Use of sources principles of qualitative research methods of data collection and analysis field techniques and writing of research results

581 Philosophy of Education (3-0) Cr 3 F SS *Prereq 9 credits in education* Owen The bases of American educational theory and practice Philosophical analysis of the viewpoints on education of selected individuals and groups

584 Classics of Educational Philosophy (3 0) Cr 3 SS *Prereq 9 credits in education* Kniker Owen Intensive study of influential statements of educational purpose organization curriculum practice and problems in the development of Western education

585 Comparative Educational Systems Industrialized Societies (2 or 3-0) Cr 2 or 3 Alt F offered 1993 *Prereq 9 credits in education* Examination of the principles and uses of comparative education in selected industrialized nations analysis of the cultural foundations and institutional forms of education recent movements for reform and innovation

586 Comparative Educational Systems Nonindustrialized Societies (2 or 3 0) Cr 2 or 3 Alt F offered 1994 *Prereq 585* Examination of the role of education in national development educational systems practices and issues in selected nonindustrialized nations the role of USAID World Bank and other donor agencies in educational planning

588 History of American Education (3-0) Cr 3 S SS *Prereq 9 credits in education* Kniker Owen Historical analysis of selected educational policies such as equal educational opportunity governance discipline and teacher education Biographies school records and government reports are examined Antecedents to current issues are stressed

590 Special Topics Cr 1 to 5 *Prereq 9 credits in education*
A History of Education
B Philosophy of Education
C Comparative Education
D Writing for Publication
E Qualitative Research

591 Supervised Field Experience Cr 1 to 6 *Prereq 6 graduate credits in special area* Supervised on the job field experience in special areas

593 Workshops Cr 1 to 5 *Prereq 9 credits in education*

599 Creative Component Cr 1 to 3

Courses for Graduate Students, major or minor

602 Social and Philosophical Issues in Education (3-0) Cr 3 each time taken maximum of 6 F *Prereq 9 credits in education* Kniker Owen A study in depth of selected educational issues movements or problems in American education

615 Seminar (1 to 3-0) Cr 1 to 3 S
A History of Education
B Philosophy of Education
C Comparative Education
D Writing for Publication
E Qualitative Research

690 Advanced Special Topics Cr 1 to 3

699 Research

Research and Evaluation (ResEv)

Mary Huba Section Leader

The research and evaluation program helps prepare professionals to work in the areas of personnel and program evaluation and educational research with emphasis on statistics and computer applications Work is offered toward the master of science degree with thesis Doctoral students in other areas wishing to develop a strong concentration in research and evaluation may do so with the guidance of section faculty

Courses Primarily for Graduate students, major or minor, open to qualified undergraduates

550 Educational Research (3-0) Cr 3 F S SS *Prereq 9 credits in education* Understanding the nature of quantitative and qualitative research reviewing the literature developing research problems and questions research designs data collection and analysis issues evaluating research studies

552 Basic Educational Statistics (3-0) Cr 3 F S SS *Prereq 550* Statistical concepts and procedures for analyzing educational data *Descriptive statistics correlation t tests and chi* square with computer applications

553 Intermediate Educational Statistics (2-1) Cr 2 F S SS *Prereq 552* A continuation of statistical concepts and procedures for analyzing educational data Inferential techniques including simple and multiple regression multiple ANOVA etc with educational computer applications

554 Intermediate Research Methods (2-0) Cr 2 S SS *Prereq 553* Intermediate research methodology and design of experiments Problem selection design measurement statistical analysis and interpretation of data

557 Computer Data Analysis Procedures (2-0) Cr 2 F Alt SS offered 1994 *Prereq 552* Use of computers in processing educational research data including use of statistical packages such as SPSSX Data coding data representation and conversion files computer organization and job control language

558 Computer Supported Learning (Curr 558) (3-0) Cr 3 F *Prereq Curr 505 or one college level course in computer programming* Instructional computer applications research and theories Design and development of computer based curriculum materials using a high level authoring language on microcomputers

560 Assessng Student Progress (2-0) Cr 2 F S *Prereq 550 or basic statistical skills* Examination of various assessment purposes Review of assessment techniques informal classroom assessment performance assessment portfolios paper and pencil tests Communicating assessment findings

561 Program Evaluation (2-0) Cr 2 S SS *Prereq 550 or H P C 580* Techniques of conducting an evaluation of educational programs A variety of evaluation models will be explored

590 Special Topics Cr 1 to 3 each time taken F S SS *Prereq Permission of instructor* Guided reading and or study on special topics

593 Workshop Cr 1 to 3 each time taken F S SS *Prereq Permission of instructor* Intensive concentrated exposure to a special educational research or evaluation problem

Courses for Graduate Students, major or minor

615 Seminar (1 0) Cr 1 may be taken 3 times F S
A Current Topics in Research and Evaluation *Prereq 550* permission of instructor
B Issues in Writing the Dissertation Proposal *Prereq 554*
C Issues in Dissertation Data Analysis *Prereq 554*

652 Program and Student Evaluation (I Ed T 652) *See Industrial Education and Technology*

690 Advanced Special Topics Cr 1 to 3 each time taken F S SS *Prereq Permission of instructor* Guided reading and/or study on special topics of an advanced nature

699 Research Cr arr F S SS *Prereq Permission of instructor*

Vocational Education

This specialization is planned for vocational education teachers in secondary schools area community colleges and for coordinators and directors of other vocational education programs Contact any of the departments that comprise the Vocational Educational Council (Professional Studies in Education Agricultural Education and Studies Industrial Education and Technology or Family and Consumer Sciences Education) for specific course requirements The Department of Professional Studies in Education is the administrative department under the guidance of the Voc Ed Council

Psychology

Camilla P Benbow Chair of Department

Professors Andre Avant Benbow Borgen Brown Cutrona Edwards, Gerrard Gibbons Hughes Karas Lewis Peters Reschly Russell Strahan Wells

Emeritus Professors Bath Charles Hannum Layton Schuster Turnage Warman Wolins Zytowski

Associate Professors Dark Epperson Johnson O Boyle Phye Scott

Assistant Professors Bushman Cunnick Hanisch Kelly Lubinski Westra

Undergraduate Study

For the undergraduate curriculum in Liberal Arts and Sciences with major in psychology leading to the degree bachelor of science see *Liberal Arts and Sciences Curriculum*

An undergraduate major in psychology may be taken as general education or as preparation for graduate study Undergraduate psychology majors who have concurrent majors with other departments such as sociology business administration or family environment may qualify for certain positions in industrial-personnel and social welfare systems as well as for professional work in correctional rehabilitation and retardation centers Such diversified education must be planned early in the undergraduate s career and in close consultation with an adviser Professional work in psychology requires graduate degrees

Departmental requirements for all students include the following supporting courses 6 credits in philosophy including 201 Engl 204 or 314 three of the following courses Biol 109 or 201 Zool 155 Chem 163 Gen 260 one of the following laboratory courses Biol 201L Zool 156 Chem 163L Stat 101 or 104 or 227 and a course in mathematics acceptable in group IIIa All students must complete Psych 101, 111 301 and 440 with a minimum grade of C– for each course and earn a C average or better for this group and select a minimum of seven courses from the following 230 280 311, 312 313 314 315 316 360 401, and 460 and earn a C average or better for this group The student may either select one or more alternate courses from the list of eleven or repeat one or more courses to attain the C average for the group

The department offers a minor in psychology which may be earned by completing 18 credits in psychology including 101 301 and 440 At least 9 of the 18 credits must be in 300 level courses and above and no more than 3 of the 9 credits may be in Psych 490 491 and 492 A grade of C- or better must be earned for each graded course used to satisfy the requirements for the minor Contact the psychology advising office for more information

English proficiency requirement The department requires a grade of C– or better in English 104 and 105 (or 105H) and a grade of C or better in Engl 204 or 314

Graduate Study

The department offers the degrees master of science and doctor of philosophy in psychology and a minor to students with a major in other departments A two-year specialist degree program is offered in school psychology

Students seeking a graduate major in psychology must have graduated from an accredited college in a curriculum substantially equivalent to the undergraduate curriculum in Liberal Arts and Sciences at Iowa State University Prerequisite to admission is at least 15 credits of basic psychology which should include a laboratory course and a measurement-statistics course

The department also participates in the interdepartmental program in industrial relations and in the interdepartmental minor in gerontology (see *Index*)

A formal class and a supervised practicum in the teaching of psychology is required of all doctoral degree candidates and strongly recommended for master s level students whose future plans may include teaching at the college level In addition students in the APA accredited counseling psychology program are required to complete a calendar-year internship in a training site or agency approved by the department s counseling faculty

Open to graduate students for minor credit only 401 413 422 430 436, 440 450 451 460

Courses Primarily for Undergraduate Students

101 Introduction to Psychology (3-0) Cr 3 F S SS Fundamental psychological concepts derived from the application of scientific method to the study of behavior Applications of psychology 101H F Honors section (For students in the University Honors Program only)

111 Orientation to Psychology (1-0) Cr R F Offered on a satisfactory/fail basis only Specialization areas and career opportunities within the field of psychology Course selections and curricular tracks for specialization requirements Required of psychology majors but recommended for anyone considering psychology as a major

131 Academic Learning Skills (2-0) Cr 1 F S SS Efficient methods of study and reading Offered on a satisfactory fail basis only Fee

230 Developmental Psychology (3-0) Cr 3 F S SS Life-span development of physical traits cognition intelligence social and emotional behavior personality and adjustment

250 Consumer Psychology (3-0) Cr 3 F S SS Theory and application of psychological principles to consumer behavior including marketing decision making sales promotion various factors influencing buying the purchase process and consumerism Introduction to consumer surveys and motivation research

280 Social Psychology (3-0) Cr 3 F S SS *Prereq 101* Individual human behavior in social contexts Emphasis on attitudes perception of others social influence attraction aggression and small group behavior such as conformity power leadership status norms

301 Research Design and Methodology (3-0) Cr 3 F S SS *Prereq Stat 101 2 courses in psychology* Rationale underlying procedures for control and manipulation of experimental variables in psychology research Designs appropriate for various research questions Laboratory experience in designing research collecting and evaluating data and preparing research reports

***302 (502 DL) Computer Applications in Psychology** (2-2) Cr 3 F S *Prereq Credit or enrollment in 301* Micro and mainframe applications of computers to the practice of psychology including word processing spreadsheets data based systems graphics statistics literature searching testing counseling use of computers in psychological research

310 Brain and Behavior (Zool 310) (3-0) Cr 3 F S SS *Prereq 101 Biol 109 or 201 or Zool 155 Chem 163* Survey of basic concepts in the neurosciences with emphasis on brain mechanisms mediating sensory processes arousal motivation learning and abnormal behavior

312 Perception—Information Processing (3 0) Cr 3 F S SS *Prereq 101* Functioning of the human perceptual systems as the brain processes information through those systems Emphasis on vision and audition

313 Learning and Memory (3-0) Cr 3 F S SS *Prereq 101* Fundamental concepts and principles of learning Consideration of data from human and animal experimentation

314 Motivation (3-0) Cr 3 F S SS *Prereq 101* Concepts and topics of motivation including curiosity pain emotion sex aggression love play addiction sleep fatigue and work

315 Drugs and Behavior (3-0) Cr 3 F S *Prereq 101 Biol 109 or 201or Zool 155* Fundamentals of psychoactive drugs and their use in experimental therapeutic and social settings

316 Cognitive Processes (3-0) Cr 3 F *Prereq 101 301 recommended* How humans process and use information in thinking problem solving and language Fundamental processes in perceiving coding storing and retrieving information from short term and long term memory

333 Educational Psychology (3-0) Cr 3 F S SS *Prereq 230 or HD FS 226 application to the teacher education program or major in psychology* Classroom learning with emphasis on cognitive development cognitive learning theory and instructional techniques Major emphasis on measurement theory and the classroom assessment of learning outcomes

346 Psychology of Women (W S 346) (3-0) Cr 3 S *Prereq 2 courses in psychology including 101* Survey of psychological literature relating to biological developmental interpersonal and societal determinants of the behavior of women

360 Psychology of Normal Personality (3-0) Cr 3 F S SS *Prereq 101* Theories and research in the study of development and functioning of normal personality

381 Social Psychology of Small Group Behavior (Soc 381) (3-0) Cr 3 S *Prereq 280 or Soc 305* A survey of small group research and theory from a social psychological perspective Major theories of

interpersonal behavior such as exchange theory equity theory and status consistency theory and major areas of research such as leadership power conformity bargaining status norms and roles

401 History of Psychology (3-0) Cr 3 F S *Prereq 4 courses in psychology* Philosophy and science backgrounds of psychology Development of theories and causes of events in academic and applied psychology

413 Psychology of Language (Ling 413) (3 0) Cr 3 Alt F offered 1994 *Prereq 101 Engl 219* Psychological processes involved in primary linguistic activities (speaking and listening) and secondary linguistic activities (writing and reading)

422 Counseling Theories and Techniques (2-2) Cr 3 F S *Prereq 3 courses in psychology* Survey of major theoretical approaches in counseling and related assessment and treatment techniques Supervised practice in basic counseling skills

430 Psychology of Adolescence (3-0) Cr 3 F S SS *Prereq 2 courses in psychology including 230* Developmental characteristics of the adolescent examination of antecedents of behavior with a goal of better understanding of this age group implications for education and guidance

434 (534 DL) Applied Behavior Analysis (3-0) Cr 3 F *Prereq 9 credits in human development and family studies or psychology* Design and evaluation of behavioral interventions in applied settings such as classrooms institutions and families Design of single subject experiments

436 Individual Differences and Exceptional Patterns of Development (3-0) Cr 3 S *Prereq 230* Behaviors abilities and needs of retarded gifted handicapped and other atypical persons differences associated with race sex and socio-economic status

***437 (537 DL) Characteristics of Giftedness** (HD FS 437) (3 0) Cr 3 Alt S offered 1994 *Prereq 9 credits in human development and family studies or psychology including Psych 230 or HD FS 102 junior classification* Understanding of giftedness and talent from cognitive developmental and social perspectives using a life span approach Current conceptualizations and research regarding gifted children and adults Implications for education and guidance

440 Psychological Measurement I (2-2) Cr 3 F S SS *Prereq 9 credits in psychology Stat 101* Principles of psychological measurement including concepts of reliability and validity interpretation of scores factors influencing performance construction and interpretation of maximal and typical performance measures uses and misuses of tests Materials fee

450 Industrial Psychology (3-0) Cr 3 F S SS *Prereq 2 courses in psychology including 101 Stat 101 Content and methods of industrial psychology* Selection and placement techniques performance appraisal training testing in industry techniques of interviewing human error accidents and job analysis Statistics including regression and correlation are used throughout the course

451 Organizational Psychology (3 0) Cr 3 F S *Prereq 2 courses in psychology including 101* Content and method of organizational psychology Emphasis on organizational theory structure of organizations motivation leadership job satisfaction communication problem solving and decision making

460 Abnormal Psychology (3-0) Cr 3 F S SS *Prereq 3 courses in psychology including 101* Description of major forms of maladaptation including anxiety mood disorders and schizophrenia Factors in the development of behavior deviations Research pertinent to the description development and maintenance of abnormal behavior

490 Independent Study Cr var maximum 3 per semester F S SS *Prereq Junior classification 6 credits in psychology permission of instructor No more than 9 credits of 490 may be counted toward a degree in psychology* Supervised reading in an area of psychology

491 Research Practicum Cr var F S SS *Prereq Junior classification permission of instructor* Supervised independent research in an area of psychology Primarily for students intending to pursue graduate education

492 Fieldwork Practicum Cr var F S SS *Prereq Junior classification 12 credits in psychology permission of instructor* Offered on a satisfactory/fail basis only Supervised fieldwork in a human service agency or other appropriate setting

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*See page 119 for information on dual listed courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***502 (302 DL) Computer Applications in Psychology** (2-2) Cr 3 F S Offered on a satisfactory/fail basis only *Prereq Credit or enrollment in 301* See description at 302 Graduate students enrolled in 502 meet with 302 and complete additional readings and an application of computers to psychology project not required of undergraduates in 302 Credit for both 302 and 502 may not be used for graduation

508 Research Methods in Applied Psychology (3 0) Cr 3 S *Prereq 440 Stat 401* Methods and issues in applied psychological research Role of theory in research fidelity of measurement selection of subjects sampling ethical issues experimenter bias data collection methods power analysis meta-analysis and professional standards for writing research articles Emphasis on research methodological issues not statistical issues

511 Advanced Physiological Psychology (3-0) Cr 3 S *Prereq 310* Neurophysiological correlates of behavior

512 Advanced Perception (3 0) Cr 3 Alt F offered 1994 *Prereq 312* Historical and modern information processing approaches to theory and research in vision and audition

514 Advanced Human Learning Memory, and Cognition (3-0) Cr 3 Alt F offered 1993 *Prereq 313 or 316 or 9 hours in psychology* Historical and contemporary survey of human symbolic behavior thinking and conceptual behavior

516 Advanced Cognition (3-0) Cr 3 Alt S offered 1995 *Prereq 316* Theoretical models and empirical research in cognition including pattern recognition visual imagery text processing attention long- and short term memory decision making problem solving language and hemispheric specialization

517 Psychopharmacology (3-0) Cr 3 Alt F offered 1994 *Prereq 311 permission of instructor* Fundamentals of drug behavior interactions with emphasis on psychoactive drugs and their use in experimental therapeutic and social settings

530 Life Span Developmental Psychology (3-0) Cr 3 S SS *Prereq 4 courses in psychology including 230* Psychological changes in human behavior from conception to senescence in physical sensory intellectual emotional and social development Intensive consideration of theories issues and data central to a life span model of development major longitudinal studies emphasized

533 Advanced Educational Psychology (3-0) Cr 3 F SS *Prereq 3 courses in psychology including 333* Human learning and cognition in educational settings Instructional theory and models Effects of learner characteristics on the learning process

***534 (434 DL) Applied Behavior Analysis** (3-0) Cr 3 F *Prereq 9 credits in human development and family studies or psychology* Design and evaluation of behavioral interventions in applied settings such as classrooms institutions and families *Design of single subject experiments*

535 Psychology of Computer based Instruction (3-0) Cr 3 Alt S offered 1994 *Prereq 533* Research and theory concerning cognitive processes and the design and development of computer based instruction Mathematical learning models adaptive instruction problem solving simulations gaming LOGO computer coaching and intelligent CBI motivation Implications for the development of CBI in various subject matters

536 Psychology of Mild Disabilities (3-0) Cr 3 Alt S offered 1995 *Prereq 436 or graduate classification* Psychological characteristics of the mildly handicapped including persons with mild mental retardation learning disabilities and behavior disorders Theory and research concerning etiology prevalence diagnosis learning adjustment treatment and education programming

***537 (437 DL) Characteristics of Giftedness** (HD FS 537) (3-0) Cr 3 Alt S offered 1994 *Prereq 9 credits in human development and family studies or psychology including Psych 230 or HD FS 102 junior classification* Understanding of giftedness and talent from cognitive developmental and social perspectives using a life-span approach Current conceptualizations and research regarding gifted children and adults Implications for education and guidance

538 Developmental Disabilities in Children (HD FS 538) (3-0) Cr 3 S *Prereq 9 credits in human development and family studies or psychology* Theories research and current issues regarding atypical development in children with disabilities Motor social cognitive and communication development in the contexts of families and educational programs

540 Psychological Measurement II (3 0) Cr 3 F *Prereq 440 Stat 401* Nature of psychological measurement Measurement and scaling theory Theoretical and statistical definitions of reliability and validity Test construction strategies

542 Psychoeducational Assessment (3-0) Cr 3 F SS *Prereq 440* Theory and research concerning assessment of intelligence and achievement with emphasis on developmental patterns and diagnosis of learning problems Critical examination of current assessment practices in clinical and educational settings

544 Practicum in Assessment *Prereq 542 and permission of instructor* Supervised practice in designing and implementing observational systems and in administering scoring interpreting and reporting individual tests
A Behavioral Assessment (2-1) Cr 2 F
B Individual Tests Children (2 1) Cr 2 S
C Testing Adult Ages (1 2) Cr 1 S

550 Advanced Industrial Psychology (3-0) Cr 3 F *Prereq 440 Stat 402* Critical evaluation of current research advanced methodologies and professional problems in industrial psychology

551 Advanced Organizational Psychology (3-0) Cr 3 S *Prereq 440 Stat 402* Examination of organizational behavior research including motivation job satisfaction organizational climate organizational effectiveness and the environment Attention rendered to theoretical methodological and applied issues

560 Advanced Personality Psychology (3 0) Cr 3 Alt F offered 1994 *Prereq 4 courses in psychology including 360* Analysis of theories of personality concepts methods and current research issues

561 Psychopathology and Behavior Deviations (3 0) Cr 3 S *Prereq 460* Critical review of theoretical perspectives and current research on the development and maintenance of the major forms of maladaptation including schizophrenic anxiety affective drug use personality psychosexual reactive and childhood disorders

562 Personality Assessment (3-0) Cr 3 S *Prereq 360 440 Stat 402* Principles concepts and methods of personality assessment Though not a practicum course exposure is given to a variety of objective projective and situational tests

580 Advanced Social Psychology Psychological Perspectives (3 0) Cr 3 F *Prereq 4 courses in psychology including 280* Current theories methods and research in social psychology with an emphasis on cognitive and interpersonal processes such as attribution social cognition attitude change attraction aggression and social comparison

581 Applications of Social Psychology Theories (3-0) Cr 3 Alt S offered 1994 *Prereq 12 credits in psychology including 280* Application of social psychological theory to various applied topics including physical and mental health stress and coping

590 Special Topics Cr var *Prereq 12 credits in psychology permission of instructor* Guided reading on special topics or individual research projects
A Counseling
B Industrial/Organizational
C School Psychology
D Individual Differences
E Experimental
F Educational
G Physiological
I Abnormal
J Engineering
K Developmental
L Exceptional Children
M Consumer
N Social
O Personality
P Psychometrics

593 Advanced Workshop in Psychology Cr var Intensive examination of a particular topic in psychology

597 Internship in Psychology Cr R *Prereq M S or specialist degree candidacy in the program area through which the internship is sought permission of instructor* Full-time supervised experience in a school human services or other setting relevant to one of the fields of psychology listed below Intended for masters of specialist level internships
A School
B Experimental

Courses for Graduate Students, major or minor

601 History of Philosophy of Psychology (3-0) Cr 3 Alt F offered 1994 *Prereq 4 courses in psychology* Origins of psychology in philosophical medical and related thought Development as an independent discipline in the nineteenth and twentieth centuries as a science and as a practice including traditional and contemporary theory and philosophy

621 Psychological Counseling Theory and Process (2-0) Cr 2 F *Prereq 4 courses in psychology including 440 and 460 permission of instructor* Combined survey of theoretical issues and approaches Didactic coverage of theoretical viewpoints at an introductory level

621L Techniques in Counseling (0 6) Cr 3 F *Prereq 621 or concurrent enrollment in 621 and permission of instructor* Development of basic counseling skills and techniques through observation role playing case studies and supervised counseling sessions

623 Vocational Behavior (2 0) Cr 2 F *Prereq 3 courses in psychology* Theoretical views research and issues in career development through the life span Methods of career counseling including appraisal interviewing assessment test interpretation and use of information sources

626 Group Counseling (2-2) Cr 3 F *Prereq 621L 691A* Theory research ethical issues and therapeutic considerations relevant to group counseling Participation in lab exercises for development of group counseling skills and observation of ongoing groups

627 Behavior Therapy (3-0) Cr 3 Alt S offered 1994 *Prereq 313* Research and theory underlying application of learning principles to techniques of behavior change Introduction to methods of behavior analysis and techniques of behavior therapy

628 Advanced Counseling Theory (2-0) Cr 2 S *Prereq Practicum in counseling psychology* In depth coverage of major theoretical positions including comparative analysis Coverage and evaluation of research on counseling interventions

629 Consultation Methods and Techniques (2 2) Cr 3 F *Prereq Graduate classification and permission of instructor* Theory and research on consultation models and methods with emphasis on interventions in school or family settings Behavioral and mental health consultation emphasized

633 Teaching of Psychology (2 0) Cr 2 S *Prereq Enrollment in degree program in psychology completion of at least 1 year of graduate study permission of instructor* Orientation to teaching of psychology at college level academic issues and problems instructional and evaluative techniques

650 Advanced Topics in Industrial-Organizational Psychology (3-0) Cr 3 F *Prereq 540 550 551 permission of instructor* Recent developments and advanced topics in I/O psychology Attitude behavior relations organizational development performance measurement scale construction meta analysis and training May be repeated for credit

652 Human Decision Theory (3-0) Cr 3 Alt S offered 1994 *Prereq 540 Stat 401* Critical analysis of the human judgment process as represented by normative and descriptive statistical models of decision making Emphasis on issues in human decision making research as policy capturing bootstrapping and non linear inference strategies

691 Practicum in Psychology Cr var *Prereq Permission of instructor* Supervised practice and experience in the following fields of specialization in applied psychology
A Counseling
B Industrial Organizational
C School Psychology
D Individual Differences
E Group Counseling Prereq 626 691A (satisfactory fail basis only)
F Advanced Counseling Prereq 691A (satisfactory fail basis only)
T Teaching Prereq 633 (satisfactory fail basis only)

692 Seminar in Psychology (1-0 to 3-0) Cr 1 to 3 each time taken *Prereq 12 hours in psychology*
A Counseling
B Industrial Organizational
C School Psychology
D Individual Differences
E Experimental
F Educational
G Physiological
I Abnormal
J Engineering
K Developmental
M Professional Issues and Ethics
N Social
O Personality
P Psychometrics
Q Microcomputers in Psychology
R Child and Family Interventions
S Child/Adolescent Psychopathology
T Longitudinal Research/Gifted

697 Internship in Psychology Cr R *Prereq Ph D candidacy in the program area through which the internship is sought permission of instructor* Full time supervised predoctoral internship experience in a school human service agency or other setting relevant to one of the following fields of psychology
A Counseling
B Industrial Organizational
C School
D Experimental

699 Research Satisfactory fail basis only

Religious Studies

(Administered by the Department of Philosophy)

Emeritus Professor Hollenbach

Associate Professors Comstock Sawyer Solomon

Religious studies is a cross-disciplinary program in the College of Liberal Arts and Sciences It gives students the opportunity to investigate and reflect on the world s religions in an objective critical and appreciative manner Though there is emphasis in religious studies on the wide variety of religious phenomena as well as on the various methods in the study of religion the aim is to help students develop their own integrated understanding of the nature of religion and its role in individual and social life

Undergraduate Study

Undergraduate studies in religious studies besides having their own intrinsic interest prepare students for graduate work in theology or religion and teaching about religion in secondary education They serve as supporting studies for graduate work in other humanities and social sciences

The program provides students with the following opportunities to major or minor in religious studies to fulfill group requirements, to use religious studies as a component of a distributed studies major to take religious studies courses that are integrated into another major to take one or more religious studies courses as electives and to develop an individual major (See the coordinator of the religious studies program for advice)

Courses are offered in five essential areas of study (1) biblical studies (2) world religions (3) religious thought (4) religious ethics (5) religion and culture
Students pursuing a major in religious studies must complete a minimum of 30 credits (not more than 9 at the 200 level) including the following core requirements

1 One 200-level religion course

2 One course from four of the following five areas
(a) biblical studies Relig 221 321 322
(b) world religions Relig 250 353
(c) religious thought Relig 240 323 350 365
(d) religious ethics Relig 301
(e) religion and culture Relig 210 334, 340 377 and

3 Two seminars Relig 465 and 475

Students may choose to do a senior thesis under the supervision of a religious studies faculty adviser This option may count 3 credits toward the completion of the major

The program offers a minor in religious studies which may be earned by completing a total of 15 credits in religious studies including one 200-level religion course and at least 6 credits in courses numbered 300 or above

In addition to all of the courses listed under *Religious Studies* there are many other courses in the university that may be relevant to a particular facet of religious studies Advisers will help students locate such courses

English proficiency requirement The department requires a grade of C or better in English 104 and 105 (or 105H) and one 300 level course in religious studies in which writing is evaluated

Graduate Study

The program offers courses for graduate minor work in religious studies as supporting work for other fields Religious studies may also be one of the three areas required for the general graduate studies master s degree

Courses open to graduate students for minor credit only 301 321 322 334 350 353 365 377 465 475

Courses Primarily for Undergraduate Students

201 Introduction to Religious Studies (3-0) Cr 3 F S SS An introduction to the modern study of religions myths beliefs rituals values social forms Examples chosen from oral cultures and Eastern and Western religions

210 Religion in America (3-0) Cr 3 F S SS Introductory study of the major beliefs practices and institutions of American Judaism Catholicism and Protestantism with attention to denominations civil religion and new religious movements

221 Introduction to the Bible (3 0) Cr 3 F S SS Modes of interpretation and methods of study Basic themes creation and exodus prophecy and messiah sin and salvation The Bible and contemporary religious ethical and social issues

240 Belief and Unbelief (3-0) Cr 3 F SS Investigation of nineteenth and twentieth century critics of religion and religious thinkers who defend religion against its critics

250 Introduction to World Religions (3-0) Cr 3 F S SS Survey of basic beliefs and practices of major contemporary religions of the world such as Hinduism Buddhism Confucianism Taoism Shinto Christianity Judaism and Islam dealing with basic problems in understanding different types of religion

***301 Religious Ethics** (3 0) Cr 3 or (3-1) Cr 4 F *Prereq One 200-level course in religious studies or Phil 201 or 230* Investigates practical moral issues such as abortion and the distribution of wealth introduces the moral traditions of selected religions and explores in detail the relationship between theological convictions and moral practice

***321 The Old Testament** (3-0) Cr 3 or (3 1) Cr 4 F *Prereq One 200 level course in religious studies* Literature and religion of ancient Judaism understood within the context of ancient Near Eastern cultures Particular attention given to the development of basic religious and ethical perspectives and their modern relevance

***322 The New Testament** (3 0) Cr 3 or (3 1) Cr 4 S SS *Prereq One 200-level course in religious studies* Literature and religion of early Christianity within the context of contemporary Judaism and Hellenistic culture Particular attention given to the development of basic religious and ethical perspectives and their modern relevance

323 Science and Religion (Hist 323) See *History*

***334 African American Religious Experience** (Af Am 334) (3-0) Cr 3 or (3 1) Cr 4 F Examination of the African American experience in America from the perspective of African American religion and the African American church with attention to political economic and social as well as spiritual concerns

340 Magic Witchcraft and Religion (Anthr 340) See *Anthropology*

350 Philosophy of Religion (Phil 350) See *Philosophy*

***353 Ways of Enlightenment Hinduism and Buddhism** (3-0) Cr 3 or (3 1) Cr 4 F *Prereq One 200-level course in religious studies* The various Hindu and Buddhist paths to realize enlightenment and freedom Special attention to meditation and yoga and their relationship to altered states of consciousness and Western methods of psychophysical integration

***365 Western Religious Thought** (3 0) Cr 3 or (3 1) Cr 4 Alt S offered 1994 *Prereq One 200-level course in religious studies* Historical approach to the development of theology in the west Focuses on a particular period (early Christian church Islamic origins Middle Ages modernity) and emphasizes cultural forces at work in the evolution of Jewish Christian and/or Muslim thought

377 Social Dimensions of Religion (Soc 377) See *Sociology*

465 Seminar Contemporary Western Religious Thought (3-0) Cr 3 S *Prereq 6 credits in religious studies* Selected issues in contemporary religious thought including Protestant Roman Catholic Jewish and secular thinkers

475 Seminar Issues in the Study of Religion (Af Am 475) (3-0) Cr 3 each time taken maximum of 6 credits F *Prereq 6 credits in religious studies*

490 Independent Study Cr 1 to 4 each time taken *Prereq 6 credits in religious studies permission of instructor approval of program chair No more than 9 credits of Relig 490 may be counted toward graduation* Guided reading and research on special topics selected to meet the needs of advanced students
H Honors

499 Peace and Justice Internship Cr var maximum of 6 *Prereq 3 credits in religious studies permission of faculty internship coordinator* Supervised placement with a peace and justice agency structured reflection on the relation of religion and practical social issues Offered on a satisfactory fail basis only

590 Special Topics in Religious Studies Cr 1 to 4 each time taken *Prereq Permission of instructor 9 credits in religious studies*
A Western Religions
B Eastern Religions
C Religious Thought
D Religion and Culture

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*Optional fourth credit entails guided research or other complementary study

Social Work

(Administered by the Department of Sociology)

Stephen M Aigner Coordinator

Professor Simons

Associate Professor Aigner Whitbeck

Undergraduate Study

The Department of Sociology offers a major in social work Social workers assist individuals families groups and communities to satisfy their material social and psychological needs As planned-change agents social workers also contribute to the development and change of social policy This program is accredited by the Council on Social Work Education It prepares students for beginning practice in public and private organizations and for admission to graduate school Graduates of the ISU social work program qualify for advanced standing in many graduate schools of social work As social work majors students take many of the required courses for sociology majors and the required social work courses When combined with electives these courses present the student with knowledge of human behavior and the social environment the generic skills of planned change for individuals families groups and communities and the knowledge and skills to initiate and develop service delivery systems and social policy

Students must have a GPA of 2 33 or better take 261 and make formal application during their junior year before being admitted to the program During their senior year and following successful completion of the social work courses students are placed in a social service agency under a field instructor Upon graduation students may join the professional organization the National Association of Social Workers Student membership is available for juniors and seniors

The social work major leads to a bachelor of science or a bachelor of arts degree Programs of study include Soc 134 201 302 305 one of 310 385 420 or 485 Stat 101 HD FS 370 and Zool 155 or 258, and either Engl 204 or 314 Majors must receive grades of C or better in Engl 104 and 105 and in either Engl 204 or 314 If not exempted by the math placement exam majors must complete Math 30 In addition programs of study for social work majors will include So Wk 261 361 461 462 463 464 469 469P and Soc 330 two of Soc 327 331 and 340 Students must receive grades of C or better in So Wk 462 and 463 to enroll in So Wk 469 and 469P Social work students are advised to consult with the social work faculty and their social work adviser in designing a program of study that will satisfy their particular interests

Courses Primarily for Undergraduates

115 Orientation to Social Work (1 0) Cr R F S Orientation to sociology and social work Occupational tracks and career options open to sociology and social work majors Introduction to career planning Recommended during second semester of freshman year or as soon as possible after transfer into the department Offered on a satisfactory/fail basis only

261 Introduction to Social Policies and Social Work (3-0) Cr 3 or (4-0) Cr 4 F S SS *Prereq 130 or 134* Analysis of socio-political and economic factors which shape government response to human problems Evolution of the social work profession and social policies and programs Social work majors enroll for the extra credit option and register for a one hour recitation section

361 Proseminar on the Profession of Social Work (1-0) Cr R S *Prereq 261 junior classification* Examine social work the characteristics of the profession and the national and state level professional organizations Review issues facing the professional social work practitioner in various practice settings Identify aspects of self awareness and learning style as a basis for professional development and life long learning

461 Sociology of the Life Course (Soc 461) See *Sociology*

462 Social Work Skills and Strategies for Intervention in Small Systems (4-0) Cr 4 F *Prereq Admission to social work program and HD FS 370* Basic social work practice skills interviewing problem assessment intervention strategies with individuals families and groups

463 Social Work Skills and Intervention with Large Systems (4-0) Cr 4 F *Prereq 261 credit or enrollment in 461 462* Planned change in policy arenas from the federal to organizational level regarding social provisions and social services policy outcomes and policy formulation with respect to issues of economic and social consequences and values of the social work profession

***464 Community Action** (Soc 464) See *Sociology*

469 Social Work Practicum Seminar (3-0) Cr 3 S SS *Prereq 261 361 461 462 463 464* Study and analysis of issues relating to the social work practicum Topics include professional development organizational change stress management and natural helping systems Field trip fee

469P Social Work Practicum (0 12) Cr 12 Offered on a satisfactory fail basis only S SS *Prereq 261 361 461 462 463 464 concurrent enrollment in 469* Field placement in selected social service agencies under professional supervision Emphasis on knowledge base generic skills and professional development Students successfully completing the course and receiving certification are assessed a fee

490 Independent Study Cr 1 to 3 each time taken *Prereq 6 credits in social work permission of instructor No more than 9 credits of So Wk 490 may be counted toward graduation*

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*See page 119 for information on dual listed courses

Sociology

Robert F Meier Chair of Department

Professors Bruton Bultena Cohen Conger Goudy Holberg Hraba Keith Klonglan Korsching Lasley Meier Miller, Mulford Ryan Schafer Simons Tait Woodman

Emeritus Professors Beal Chang Warning

Associate Professors Aigner Dobratz Harrod Hoyt Jones Johnson Lee Lorenz Mazur Padgitt Roberts Sapp Sawyer Wells Whitbeck

Assistant Professor Horton

Undergraduate Study

The department offers work for degrees bachelor of arts and bachelor of science both with majors in sociology and social work It offers work for the bachelor of science in social work and in public service and administration in agriculture It offers work also for a minor in criminal justice studies Programs of study in sociology offered in both the College of Agriculture and the College of Liberal Arts and Sciences are outlined in this section The programs in social work offered in the College of Liberal Arts and Sciences are described under *Social Work* For the undergraduate curriculum in Liberal Arts and Sciences with majors in sociology and social work leading to the degrees of bachelor of arts and bachelor of science see *Liberal Arts and Sciences Curriculum* For the undergraduate curriculum in agriculture with major in public service and administration in agriculture leading to the degree bachelor of science see *Agriculture Curriculum in Public Service and Administration in Agriculture* For the undergraduate curriculum in Liberal Arts and Sciences with a minor in criminal justice studies see *Liberal Arts and Sciences Curriculum*

The department offers a minor in sociology which may be earned by completing the following 15 credits 130 or 134 201 305 and 6 additional credits in sociology courses at the 300 or higher level in which a C or better was earned and which were completed at ISU

College of Liberal Arts and Sciences—Sociology

A major in sociology can serve as a liberal arts education as preparation for various positions in social service and related occupations in business and industry as background for professional education in such areas as social work law and theology or as a basis for graduate professional training as a sociologist in academic government business and industrial settings

A program of study that meets the needs and interests of the student and department requirements will be developed in consultation with the major adviser Programs of study will include 115 130 or 134 201 302 305 327 or 330 or 331 401 Stat 101 and either Engl 204 or 314 Majors must complete an additional 9 credits in sociology at the 300 level or above Majors must receive grades of C or better in Engl 104 and 105 and a grade of C or better in either Engl 204 or 314 If not exempted by the math placement exam majors must complete Math 30 Programs leading to a bachelor of arts degree will emphasize additional coursework in groups I II and IV of the general education requirements Programs leading to a bachelor of science degree will emphasize additional coursework in groups III and IV of the general education requirements Some of the possible fields of concentration are criminal justice system community (urban and rural) sociology family sociology sociology of work social science teaching research methods and statistics social change and sociology of development complex organizations human population and ecology social psychology and sociological theory

In consultation with their advisers students may gain work experience and develop their skills in their field of concentration through the field observation and practice options of 454 460 and So Wk 469P

College of Agriculture—Public Service and Administration in Agriculture

The curriculum in public service and administration in agriculture is designed for students who desire an interdisciplinary education to pursue a career with agriculturally related governmental and private agencies or with businesses and industries that are concerned with public services in agriculture Students will explore the planning and implementing of agriculturally related programs in communities (town city or county) multicounty areas states regions and at the federal level

The curriculum has a broad base of general education subjects including credits in communications mathematics physical and biological sciences social sciences and humanities The technical subjects represent a combination of sociology economics government and technical agriculture with emphases on social and economic change, history of public services complex organizations interagency relationships community leadership, community action adoption and diffusion group dynamics and political and legal behavior as they relate to agriculture and rural areas

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in sociology and rural sociology and minor work for students majoring in other departments For M S and Ph D departmental requirements see *Program of Graduate Study for Degrees in Sociology and Rural Sociology* available from the department office The department offers concentrations in a number of areas e g family life course and aging methodology rural sociology social change and development social deviance and mental health social issues and public policy social organization and social psychology The Department of Sociology does not offer a nonthesis master s program

Although the department stipulates no language requirement for either the degree master of science or the degree doctor of philosophy specifying competence in one or more languages may be desirable in some instances

The department also participates in the interdepartmental program in industrial relations interdepartmental majors in transportation planning and water resources and interdepartmental minors in gerontology mineral resources and technology and social change (See *Index*)

Courses open to graduate students for minor credit only 401 411 415 420, 476

Courses Primarily for Undergraduate Students

110 Orientation to Public Service and Administration in Agriculture (1-0) Cr R F Survey of public service and administration in agriculture Exploration of career tracks and career planning Recommended during first semester of freshman year or as soon as possible after transfer into the department

115 Orientation to Sociology (1-0) Cr R F S Orientation to sociology Occupational tracks and career options open to sociology Introduction to career planning Recommended during second semester of freshman year or as soon as possible after transfer into the department Offered on satisfactory/fail basis only

130 Rural Institutions and Organizations (3-0) Cr 3 F S An introductory analysis of sociological concepts and theories as they relate to rural institutions and organizations Emphasis on the static structure and function of these institutions and organizations and on their dynamic adaptation to changing societal environmental and economic conditions General sociological principles and perspectives Credit for only 130 or 134 may be applied toward graduation

134 Introduction to Sociology (3-0) Cr 3 F S SS Social interaction and group behavior with emphasis on contemporary U S society including issues relating to socialization inequality and changing rural and urban communities Analysis of relationships among the institutions of family religion political participation work and leisure Credit for only 130 or 134 may be applied toward graduation

201 Social Organization (3-0) Cr 3 F S *Prereq 130 or 134* An overview of behavior existing at various levels of society (e g groups organizations institutions communities and nation states)

219 Courtship and Marriage (3-0) Cr 3 F S SS *Prereq 130 or 134* Sociological analysis of courtship and marriage relationships across the life cycle Attention also given to alternative and single lifestyles to parenting and to family life

235 Social Problems (3-0) Cr 3 F S SS *Prereq 130 or 134* Sociological concepts and methods employed in the analysis of various social problems including crime substance abuse problems with institutions rural and urban problems and international concerns Consideration of various solutions

241 Youth and Crime (CJ St 241) (3-0) Cr 3 F *Prereq 130 or 134* An examination of delinquency that focuses on the relationship between youth as victims and as offenders social and etiological features of delinquency the role of the criminal justice system delinquent s rights and traditional and alternative ways of dealing with juvenile crime Field trip fee

264 Small Group Dynamics (3 0) Cr 3 F S SS *Prereq 130 or 134* An introduction to the processes of interpersonal behavior in small groups Group decision making coalitions conformity intergroup relations status and role effects leadership group development and group conflict Includes student participation in small group processes

302 Research Methods in Sociology (2-2) Cr 3 *F S Prereq 130 or 134 201 and Stat 101* Introduction to research in sociology Principles of scientific inquiries and basic understanding of research methods

305 Social Psychology A Sociological Perspective (3 0) Cr 3 F S SS *Prereq 130 or 134* Examination of human behavior in a social environment with emphasis on development of the self interpersonal relations attitudes and small groups

310 Community (3-0) Cr 3 F *Prereq 130 or 134* Comparative analysis of the institutional structure of rural urban and suburban communities community as an ecological and social system power relationships analysis of planned and unplanned processes of social change

325 Agriculture in Transition (3 0) Cr 3 S The impacts of agricultural changes on farm families rural communities and consumers Past present and future trends in family farms and their social implications

327 Sex and Gender in Society (W S 327) (3 0) Cr 3 F S SS *Prereq 130 or 134* How the biological fact of sex is transformed into a system of gender stratification The demographics and social positions of women and men in the family education media politics and the economy Theories of the social psychological and sociological bases for behavior and attitudes of women and men The relationship between gender class and race

330 Ethnic and Race Relations (Af Am 330) (3-0) Cr 3 F S SS *Prereq 130 or 134* Analysis of ethnic and race relations particularly in America emphasis on the sociology and psychology of race and ethnic relations

331 Social Class and Poverty (3 0) Cr 3 F S *Prereq 130 or 134* Social stratification and processes resulting in poverty implications of status class and poverty for people of different races ethnicity and gender

340 Deviant and Criminal Behavior (CJ St 340) (3-0) Cr 3 S SS *Prereq 130 or 134* The meaning identification and causes of social deviance role of social institutions in correction control and prevention of social deviance

345 Population Problems and Society (3 0) Cr 3 F *Prereq 130 or 134* Human overpopulation impact on food resources and services population growth and development trends of births deaths and geographic movement projecting future population population control and family planning population policies and laws comparison of the United States with other societies throughout the world

377 Social Dimensions of Religion (Relig 377) (3 0) Cr 3 S *Prereq 130 or 134* The influence of religion in society both as a conservator of values and as a force for social change

380 Sociology of Work (3 0) Cr 3 F S *Prereq 130 or 134* Sociological clinical and holistic analyses of work behavior meanings and settings

381 Social Psychology of Small Group Behavior (Psych 381) (3-0) Cr 3 S *Prereq Soc 305 or Psych 280* A survey of small group theory and research from an interdisciplinary social psychological perspective

382 Environmental Sociology (Env S 382) (3-0) Cr 3 F S Environmental quantity and quality as social problems value orientations toward nature environmental quality movement institutional patterns affecting use of natural resources resource management issues

401 Contemporary Sociological Theories (3 0) Cr 3 F S *Prereq 9 credits in sociology* Both historical and modern social theories as applied to understanding and researching the social world

411 Social Change in Developing Countries (3-0) Cr 3 F 1993 S 1995 *Prereq 130 or 134 plus 3 credits in social sciences* Social change and development in Third World countries international interdependence causes and consequences of persistent problems in agriculture city growth employment gender equality basic needs local and worldwide efforts to foster social change and international development

412 Senior Seminar on Career Development (1-0) Cr 1 F *Prereq Most of major core courses senior classification* Transition from student to professional Career development procedures including self assessment short and long term goals strategies for the job search development of contacts and sources resumes and interviews Enrollment preferred in first semester as senior Offered on satisfactory fail basis only

415 Adoption and Diffusion of Innovations (3-0) Cr 3 S *Prereq 130 or 134 plus 3 credits in social sciences* Processes of technology transfer Factors related to differential rates of adoption of new technology as applied to topics in agriculture development and business marketing

420 Complex Organizations (3-0) Cr 3 F SS *Prereq 130 or 134 plus 3 credits in social sciences* Bureaucracies organizations and agencies as social systems Internal processes Influence of interpersonal and structural variables Models of effectiveness Linkages and networks Importance of multinational organizations

***425 (525 DL) Social Movements and Revolution** (3-0) Cr 3 Alt SS offered 1995 *Prereq 6 credits in sociology* Origins and nature of collective action social movements and revolutions commitment mobilization and group dynamics movement stages class and structural factors resulting social dynamics theoretical approaches and current evidence Third World and other international comparisons

***435 (535 DL) Urban Sociology** (3 0) Cr 3 S *Prereq 130 or 134 plus 3 credits in social sciences* Growth and function of cities and macro systems of cities human and spatial ecology urban lifestyles subcultures work and poverty communities urban renewal housing and homelessness solutions and planning for cities international comparisons

454 Field Observation and Practice Cr var maximum of 12 Offered on a satisfactory fail basis only F S SS *Prereq Junior or senior classification permission of faculty internship coordinator Major or minor in sociology or PSA or 201 302 305* Supervised practice in industrial plants business organizations and governmental agencies Not more than 12 credits of field experience (Soc 454 460 and So Wk 469P) may be counted toward meeting the required 47 credits of upper level courses and the total of 124 5 credits required for graduation No credits in Soc 454 may be used to satisfy minimum sociology requirements for sociology majors
A General Sociology
B Rural Sociology

460 Criminal and Juvenile Justice Practicum (CJ St 460) Cr var maximum of 12 Offered on a satisfactory fail basis only F S SS *Prereq Junior or senior classification permission of criminal justice studies coordinator major or minor in sociology criminal justice studies minor or PSA 241 or 340* Study of the criminal and juvenile justice systems and social control processes Supervised placement in a police department prosecutor s office court probation and parole department penitentiary juvenile correctional institution community based rehabilitation program or related agency Not more than 12 credits of field experience (Soc 454 460 and So Wk 469P) may be counted toward meeting the required 47 credits of upper level courses and the total of 124 5 credits required for graduation No credits in Soc 460 may be used to satisfy minimum sociology requirements for sociology majors

461 Life Course Sociology (So Wk 461) (3 0) Cr 3 F *Prereq 6 credits in sociology* Theoretical and empirical perspectives on individuals facing developmental tasks age related norms values and subcultures Decisions and issues faced by individuals as they progress through stages of the life cycle

***464 (564 DL) Community Action and Leadership** (So Wk 464) (3-0) Cr 3 F S SS *Prereq 6 credits in sociology* Methods of planning organizing and conducting planned social change and other action programs in communities Strategies of change change agent roles client need identification community organization strategies citizen participation leadership identification and development program planning and evaluation

***473 (573 DL) Youth and Society** (3-0) Cr 3 Alt F offered 1993 alt SS offered 1995 *Prereq 6 credits in sociology* Analysis of problems of adolescents and youth created by the impact of changing institutional structure on the transition from childhood to adulthood

476 The Aged in American Society (Geron 476) (3 0) Cr 3 S *Prereq 6 credits in sociology* A survey of sociological problems of the aging and the social implications of a sizable aged population

***484 (584 DL) Criminal and Juvenile Justice Process and Institutions** (3-0) Cr 3 Alt S offered 1994 *Prereq 6 credits in sociology* The criminal and juvenile justice systems Dynamics of contemporary police judicial correctional institutions and community based rehabilitation programs key historical developments theory and research

485 Sociology of the Family (3-0) Cr 3 S *Prereq 6 credits in sociology* The contemporary family in developing industrial and post-industrial societies Effects of modernization and family policies on family structures and functions

490 Independent Study Cr 1 to 3 each time taken *Prereq 6 credits in sociology permission of instructor Students in the College of Agriculture must be of junior or senior classification and may use no more than 6 credits of Soc 490 toward the total of 128 credits required for graduation Students in the College of Liberal Arts and Sciences may count no more than 9 credits of 490 toward graduation*
A General Sociology
B Rural Sociology
H Honors
E Senior Seminar

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*See page 119 for information on dual listed courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

505 Historical Sociological Theory (3-0) Cr 3 F *Prereq 6 graduate credits in sociology* Evolution of sociological thinking focusing on the era from the Enlightenment to 1925 positivism conflict and functionalist traditions organicism and sociology of knowledge perspectives

511 Intermediate Research Methods I (2 2) Cr 3 S *Prereq 302 Stat 401* Research methods in sociology including problem selection research design hypothesis formulation sampling alternative measurement techniques laboratory emphasis on application of methodologies to the design of a class research project introduction to computer systems

512 Intermediate Research Methods II Quantitative (2 2) Cr 3 Alt F offered 1994 *Prereq 511 credit or enrollment in Stat 401* Applied quantitative research methods in sociology Design

and implementation of a course based research project including data collection analysis and presentation of results Quantitative survey data gathering techniques using self administered questionnaires mail surveys telephone interviews or personal interviews Laboratory emphasis upon completion of data gathering analysis and report writing

513 Intermediate Research Methods II Qualitative (2 2) Cr 3 Alt F offered 1993 *Prereq 511 credit or enrollment in Stat 401* Applied qualitative research methods in sociology Design and implementation of a course-based research project including data collection analysis and presentation of results Qualitative data gathering techniques using observational historical in-depth interviewing or content analysis approaches Laboratory emphasis on completion of data gathering analysis and report writing

517 Sociological Evaluation Methods (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in sociology including 512* Examination of various method ological perspectives and procedures regarding the issues of validity measurement ethics and the utilization of evaluative findings relevant to planned social action programs of governmental units and human service organizations

520 Social Psychology A Sociological Perspective (3-0) Cr 3 F *Prereq 305 or Psych 280* Examination of cognitive symbolic interaction exchange role reference group and dramaturgical approaches Assessment of contemporary issues in social psychology

521 Small Groups (3-0) Cr 3 Alt S offered 1994 *Prereq 305 or Psych 280* Examination of alternative theoretical models and methods of studying small groups

522 Attitude and Attitude Change (3-0) Cr 3 Alt S offered 1995 *Prereq 305 or Psych 280* Analysis of theories of attitude and attitude change current controversies between the theories examined as well as supporting research

***525 (425 DL) Social Movements and Revolution** (3-0) Cr 3 Alt SS offered 1995 *Prereq 6 credits in sociology* Origins and nature of collective action social movements and revolutions commitment mobilization group dynamics movement stages class and structural factors resulting social dynamics theoretical approaches and current evidence Third World and other international comparisons

528 Sociology of Gender (W S 528) (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in sociology* Examination of the social construction of gender and the social organization of gender inequality Analysis of gender identity in socialization interpersonal behavior the media and the economy Investigation of the intersection of gender race and class

529 Minority Groups (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in sociology* Analysis of racial and ethnic inequality in the United States and the world focus on the implications of the changing world social and economic order for differences in racial and ethnic groups relative to wealth status and power a critical examination of majority group domination of minority groups in various societies

530 Social Organization (3-0) Cr 3 S *Prereq 6 credits in sociology* Methodological and analytical issues associated with the study of group structure contemporary theories of social organization

532 Organizations and Their Environments (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in sociology* Comparative analysis of complex organizations complex organizations as semi-open systems Interorganizational relations and organizational effectiveness

533 Models of Community (3-0) Cr 3 Alt F offered 1993 *Prereq 6 credits in sociology* Emphasis on different models or frames of reference used in community analysis Theoretical and methodological tools current views of community problems and explanation of social and cultural change are presented for each model

534 Social Stratification (3-0) Cr 3 Alt F offered 1993 *Prereq 6 credits in sociology* Critical examination of the causes and consequences of social stratification and inequality classical theories contemporary frameworks and recent empirical studies international stratification patterns

***535 (435 DL) Urban Sociology** (3-0) Cr 3 S *Prereq 130 or 134 plus 3 credits in social sciences* Growth and functions of cities and macro systems of cities human and spatial ecology urban lifestyles subcultures work and poverty communities urban renewal housing and homelessness solutions and planning for cities international comparisons

540 Comparative Social Change (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in sociology* Contemporary theories of social change modernization dependency and development are critically examined methodological issues identified supporting research explored applicability of theoretical models concepts and strategies to current national and international needs are evaluated

542 Domestic Rural Development (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in sociology* Sociological perspectives on contemporary theory and practice in domestic rural development implications of farm and nonfarm sector interdependencies for rural development policies and programs examination of the development roles of federal and state agencies land grant institutions and the private sector

543 Issues in Rural Sociology (3-0) Cr 3 Alt F offered 1994 *Prereq 6 credits in sociology* Historical development of rural sociology overview of substantive areas with emphasis on current research and theoretical issues future of the discipline of rural sociology

545 Applied Sociology (3-0) Cr 3 Alt F offered 1993 *Prereq 512 520 530 Stat 401* Definitions of applied sociology Consideration of the knowledge base career options and value dilemmas associated with the roles of planner consultant evaluator and clinician

548 Sociology of Natural Resources (3-0) Cr 3 Alt S offered 1995 *Prereq 6 credits in sociology* Sociological perspectives on contemporary natural resources issues including tradeoffs between economics and environment short- and long-term needs individual and collective rights and the needs of developed and developing countries The interaction of social and natural systems and the politics policies values and institutions governing the use of land water energy air and space both internationally and domestically The concept of sustainable development

549 Social Impact Assessment (3-0) Cr 3 Alt S offered 1994 *Prereq 6 credits in sociology* Alternative techniques for conducting social impact and social soundness analyses review of social soundness studies used in international development projects and social impact studies conducted in the U S under the National Environmental Policy Act application of social impact analysis to agricultural rural development and other public policies roles of sociologists on international impact assessment teams field experience in impact assessment

550 Population Dynamics (3-0) Cr 3 Alt SS offered 1995 *Prereq 6 credits in sociology* Current and historical population trends examination and critique of demographic theories techniques of measuring demographic phenomena survey of current research on population issues population policy and development planning

561 Life Course Research (3-0) Cr 3 F *Prereq 6 credits in sociology* A survey of current research and theory in life course sociology The social antecedents and consequences of developmental transitions throughout the life course

***564 (464 DL) Community Action and Leadership** (3 0) Cr 3 S *Prereq 6 credits in sociology* Methods of planning organizing and conducting planned social change and other action programs in communities strategies of change agent roles client need identification community organization strategies citizen participation leadership identification and development program planning and evaluation

***573 (473 DL) Youth and Society** (3-0) Cr 3 Alt F offered 1993 alt SS offered 1995 *Prereq 6 credits in sociology* Analysis of problems of adolescents and youth created by the impact of changing institutional structure on the transition from childhood to adulthood

576 Sociological Perspectives on Aging (3 0) Cr 3 Alt F offered 1993 *Prereq 6 credits in sociology* Theoretical perspectives on the aging process social and social psychological changes accompanying aging emphasis on research techniques and findings

582 Social Deviance (3-0) Cr 3 Alt SS offered 1994 *Prereq 6 credits in sociology* Theory and research regarding perceptions and causes of and reactions to deviant behavior Mental illness violent behavior substance abuse and property crime are among the types of deviant behavior considered

***584 (484 DL) Criminal and Juvenile Justice Process and Institutions** (3-0) Cr 3 Alt S offered 1994 *Prereq 6 credits in sociology* The criminal and juvenile justice systems Dynamics of contemporary police judicial correctional institutions and community based rehabilitation programs key historical developments theory and research

585 Contemporary Research in the Family (3-0) Cr 3 Alt SS offered 1995 *Prereq 6 credits in sociology* A survey of current research in the family emphasis on new methodologies and theories

590 Special Topics Cr 1 to 3 each time taken *Prereq 6 credits in sociology senior or graduate classification*
A General Sociology
B Rural Sociology

591 Orientation to Sociology (1 0) Cr R F *Prereq Formal admission into the sociology graduate program* Introduction to the department current graduate student policies at department and university levels departmental administrative procedures Required of graduate students Offered on a satisfactory fail basis only

592 Teaching Sociology (3-0) Cr 3 Alt SS offered 1994 *Prereq Graduate classification in sociology* Pedagogical and substantive issues in the teaching of sociology at the college level focusing on course organization instructional objectives techniques of presentation and instruments for evaluation of learning and instruction

593 Workshops Cr 1 to 3
A General Sociology
B Rural Sociology

595 Internship (As arr) Cr 6 to 9 F S SS *Prereq 12 graduate credits in sociology approval of major professor and internship coordinator* Supervised practice for students to apply sociological knowledge and skills to work with client groups

599 Research for Master's Thesis
A General Sociology
B Rural Sociology

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*See page 119 for information on dual listed courses

Courses for Graduate Students, major or minor

600 Theory Construction and Application (3-0) Cr 3 Alt F offered 1994 *Prereq Theory and research methods courses at the graduate level* Structure of sociological theories linkages of different theoretical perspectives to research problems use of research in theory construction

607 Contemporary Sociological Theory (3-0) Cr 3 Alt S offered 1994 *Prereq 6 graduate credits in sociology* Survey of theoretical developments since 1925 including the rise of structural functionalism symbolic interactionism conflict theories phenomenology exchange theory and others

611 Sociological Measurement (3-0) Cr 3 Alt S offered 1994 *Prereq Stat 401* Reliability and validity for observed and latent variables exploratory and confirmatory factor analysis in the construction and evaluation of measurement models

613 Advanced Theory Construction and Causal Modeling (3 0) Cr 3 Alt S offered 1995 *Prereq 512 Stat 404* Formal strategies of measurement research design and theory construction including contemporary approaches to confirmatory factor analysis and linear structural equations (LISREL)

642 Sociology of Adoption and Diffusion (3 0) Cr 3 Alt F offered 1993 *Prereq 6 graduate credits in sociology* Sociological and social psychological theories related to adoption and diffusion of new ideas analysis of adoption and diffusion models methods of field research factors related to rates and intensity of adoption and diffusion adopters characteristics related to rates of adoption

645 Sociology and Policy Analysis (3-0) Cr 3 Alt S offered 1994 *Prereq 545* Application of sociological theories and methods for conducting policy research The interaction between the political process and the role of the policy research in problem definition policy design and policy implementation as viewed from alternative paradigms ethical issues associated with conducting research in a policy setting and for setting a public policy agenda

666 Political Sociology (3 0) Cr 3 Alt S offered 1993 *Prereq 6 credits in sociology* Seminar on the relationship between state and society with analysis of theoretical frameworks political participation power social movements elites democracy and capitalist society

675 Current Topics in Family and the Life Course (3-0) Cr 3 S *Prereq 6 credits in sociology* An advanced seminar on current developments in a selected area of study in the sociology of family and the life course Deals with theoretical empirical and methodological issues

698 Seminars in Sociology (3-0) Cr 3 each
- A Family Life Course and Aging
- B Methodology
- C Rural Sociology
- D Social Change and Development
- E Social Deviance
- F Social Issues and Public Policy
- G Social Organization
- H Social Psychology

699 Dissertation Research
- A General Sociology
- B Rural Sociology

Speech Communication

Mark V Redmond Chair of Department

Professor Dearin

Emeritus Professors Brandt Drexler Underhill

Associate Professors Atkins Gunter Hirvela Myers Pickett Redmond Venkatagiri

Assistant Professors Kaufmann F Vallier J Vallier Vrchota Waggoner

Instructor Stone

Undergraduate Study

The department offers introductory courses designed for all students as part of their general education as a complement to professional training and as an introduction to further study within the discipline

Students who major or minor within the department can prepare themselves for a wide variety of future employment opportunities depending upon individual interests background and abilities Present curricula can prepare students for the study of law or theology for positions in business and industry or education and for graduate level work in speech communication speech-language-hearing sciences or related disciplines

A student electing to major within the department must meet the particular requirements of one of the following options communication disorders (bachelor of science) communication studies interpersonal and rhetorical communication or speech education (bachelor of arts)

General requirements for majors in speech communication are as follows (1) completion of all credits used to meet a particular curriculum s requirements with a grade of 2 0 or better and (2) no credits in 290 490 493 499 and 590 may be applied toward the minimum required credits within any prescribed option (CmDis 31 credits ComSt 36 credits IRC 33 credits SpEd 47 credits) Specific requirements for the major in speech communication with its various options are listed under their respective descriptions

The department s English proficiency requirement may be met by (1) completion of Engl 104 105 (or 105H) or its equivalent with a grade in each of 2 0 or better (2) one additional writing course beyond Engl 105 with a grade of 2 0 or better from the following approved list Engl 204 302-305 309 314 415 JI MC 201

The requirements for minors within the department may be fulfilled by credit in ComSt 101 or Sp Cm 212 (whichever is appropriate) plus at least 15 additional hours of which 9 credits are in courses numbered 300 or above All 15 credits must be taken within one of the three following areas communication disorders communication studies or interpersonal and rhetorical communication All credits taken for the minor must have a grade of 2 0 or higher No credits in 290 490 493 499 and 590 may apply toward the minor

The department participates in the interdisciplinary undergraduate minor program in gerontology and the program in linguistics

Students are encouraged to participate in the departmentally supported co-curricular activities These activities include Iowa State University Forensics the Sign Language Club ASTD (American Society for Training and Development) and NSSLHA (National Student Speech-Language-Hearing Association)

Speech Communication Education

Students fulfilling the requirements for teacher licensure prepare to teach speech communication dramatic arts and media at the secondary school level In addition they prepare to direct co-curricular and extracurricular activities

Each student seeking teacher licensure in speech communication must fulfill the requirements outlined in the Teacher Education section of this bulletin In addition each student must maintain a 2 5 grade point average in all courses taken to be admitted to the College of Education

Communication Disorders (CmDis)

The curriculum is preprofessional and consists of coursework in speech-language pathology and audiology as well as study in related disciplines It provides a broad-based background in normal communication developmental processes The following courses are required for an emphasis in communication disorders Sp Cm 212 CmDis 271 275 370 376 379 385 470 471 and 498 plus at least 4 more credits at the 300 level or above in communication disorders courses In addition the following courses are strongly recommended ComSt 101 CmDis 171 476 477 479 480 485 Phys 198 Zool 155 Engl 314 Psych 230 333 El Ed 204 and SecEd 406 In addition to this basic academic background the student has an opportunity to observe and participate as a student clinician in the Iowa State University Speech-Language-Hearing Clinic and acquire up to 150 clock hours of undergraduate clinical practicum experience

Successful completion of the preprofessional program prepares the student for professional graduate study in this field A master s degree in communication disorders additional supervised clinical practicum experience at the graduate level a clinical fellowship year and a written academic and clinical competency exam are required beyond this program to practice the profession A student must plan to attend another school for graduate work

Communication Studies (ComSt)

The communications studies program is a focused course of inquiry into the contemporary study of human communication This program emphasizes applied communication theory and research in interpersonal small group organizational and intercultural communication For those interested in the study of mass communication see *Index Journalism and Mass Communication Courses and Programs*

A communications studies option prepares students for graduate education and careers in business and industry Students emphasizing communications studies should find their career opportunities enhanced in professions requiring applied communication expertise e g human resource management personnel training and development sales management public relations organizational development public information business communication and international and intercultural relations

The following courses are required for an emphasis in communication studies ComSt 101 310 311 314 317 418 498 and 9 additional hours in the area (see adviser for list of approved courses) Stat 101 Psych 301 or Soc 302 Engl 302 or 309 or 314 or 415 plus 6 hours in an allied discipline (see adviser for list of approved courses)

Interpersonal and Rhetorical Communication (Sp Cm)

The interpersonal and rhetorical communication area provides a thorough understanding of communication theories principles and applications Students will be required to complete courses which provide a solid grounding in the theories of

communication the nature of rhetorical principles in communication and the role of communication in creating maintaining and changing human relationships The following courses are required for an emphasis in interpersonal and rhetorical communication ComSt 101 311 314 317 Sp Cm 212 305 327 412 and 498 (Senior Seminar) plus an additional 6 credits from courses in interpersonal and rhetorical communication (Sp Cm) for a total of 33 semester hours

Emphasis in the area prepares students for graduate study the study of law or theology to teach speech communication in high school or enter a variety of communication-*related careers and occupations in business* and professional organizations Communication internships in business and professional settings are available for qualified students The area s courses also provide a minor concentration for students in business English journalism foreign languages and literatures and the social sciences

Theatre

The theatre program is administered by the Department of Music See *Index*

Graduate Study

The department offers courses for a graduate minor in speech communication as well as supporting work for other disciplines The Department of Speech Communication also participates in the interdepartmental program leading to a master s degree in General Graduate Studies

Within the speech communication graduate minor a student may elect a general program of study or concentrate in one of the three areas of emphasis which constitute the department communication disorders communication studies or interpersonal and rhetorical communication

Open to graduate students for minor credit only CmDis 370 376 385 470 471 477 479 480 493 ComSt 414 418 493 Sp Cm 305 327 412 493

Communication Disorders (CmDis)

Courses Primarily for Undergraduate Students

170 Speech Improvement for Nonnative Speakers (U St 170) (1-2) Cr 2 F S For nonnative speakers of English only Development of effective English vowel and consonant productions intelligibility in conversational English and appropriate stress patterns

171 Improving Speech Effectiveness (Sp Cm 171) (2 0) Cr 2 F S For native speakers of English only Development of effective professional speech behaviors voice quality articulation pronunciation language skills and fluency applied to conversational and extemporaneous speech

271 Phonetics (Ling 271) (3 0) Cr 3 S Analysis of speech through study of individual sounds their variations and relationships in context practice in auditory discrimination and transcription of sounds of American English description of speech sounds in terms of their production transmission and perception

275 Introduction to Communication Disorders (Ling 275) (3-0) Cr 3 F S SS Survey of nature causes types evaluation and treatment of major communication disorders including phonology adult and child language voice cleft palate fluency and hearing disorders

286 Basic Sign Language (Ling 286) (3 0) Cr 3 F S SS Development of basic skills in the use and understanding of signed English a modification of American Sign Language

290 Special Projects Cr 1 to 2 each time taken maximum of 4 credits F S SS *Prereq 3 credits in communication disorders permission of department chair*

370 Speech and Hearing Mechanism (Ling 370) (4 0) Cr 2 S First 8 weeks *Prereq 271 or 275* Anatomy and physiology of respiration phonation articulation and hearing

376 Phonological Disorders (3-0) Cr 3 F *Prereq 271 275 370* Nature etiology assessment and management of disorders of speech sound production

379 *Clinical Management of Communication* Disorders (3 0) Cr 3 S *Prereq 376 or 471* Principles and methods employed in the clinical management of communication disorders preparation for clinical practicum For those who plan a career in communication disorders

385 Audiology (3 0) Cr 3 S *Prereq 275 370* Nature etiology and assessment of hearing disorders Materials fee

470 Speech and Hearing Science (Ling 470) (4-0) Cr 2 S Second 8 weeks *Prereq 370* Acoustical and neurological bases of speech production and comprehension

471 Language Development (Ling 471) (3-0) Cr 3 F *Prereq 275 or Psych 230 or HD FS 129 or graduate classification* Definition of components of language of developmental processes related to each component (semantics lexicon syntax morphology pragmatics) Summary of normative information in infants children and adolescents Survey of nature and types of language disorders

476 Voice Disorders (4-0) Cr 2 F First 8 weeks *Prereq 370* Nature etiology assessment and management of voice disorders

477 Fluency Disorders (4 0) Cr 2 F Second 8 weeks *Prereq 275* Nature etiology assessment and management of fluency disorders

479 Practicum in Communication Disorders Cr 1 to 2 each time taken maximum of 4 F S *Prereq 379 376 or 477 or 480 permission of instructor*

480 Language Disorders of Children (3 0) Cr 3 S *Prereq 471 or 275 or HD FS 224 or 225* Nature etiology assessment and management of language disorders in children and adolescents

485 Aural Habilitation (3-0) Cr 3 F *Prereq 471 or 275 or HD FS 224 or 225* Educational social psychological and communication consequences of hearing disorders Nonmedical management of hearing impairment

490 Independent Study Cr 1 to 3 each time taken maximum of 9 F S SS Only one independent study enrollment is permitted within the department per semester *Prereq 9 credits in communication disorders junior classification permission of department chair*

493 Workshop Cr var 1 to 3 each time offered F S *Prereq 12 credits in communication disorders* Offered irregularly to explore special topics not adequately covered in other course offerings Materials fee

498 Senior Seminar (2-0) Cr 2 S *Prereq 15 credits in communication disorders senior classification* Directed study of a communication issue identified by each student Students synthesize relevant theory and research culminating in a senior project/paper

499 Communication Internship Cr var 1 to 8 each time taken maximum of 8 F S *Prereq 18 credits in communication disorders other courses deemed appropriate by faculty adviser 2nd semester junior or senior standing cumulative GPA of at least 2 5 overall and 3 0 in communication disorders and permission of the internship committee* Supervised application of communication disorders in professional settings

Courses Primarily for Graduate Students, open to qualified undergraduates

504 Seminar Cr 1 to 3 each time taken F S SS *Prereq 9 credits in communication disorders*

590 Special Topics Cr 1 to 4 each time taken maximum of 12 credits F S SS *Prereq Permission of department chair*

Communication Studies (ComSt)

(For those interested in the study of mass communication see *Index Journalism and Mass Communication Courses and Programs)*

Courses Primarily for Undergraduate Students

101 Introduction to Communication (3-0) Cr 3 F S SS An introduction to communication theory the development and functions of communication and a survey of interpersonal small group organizational and intercultural communication

102 Fundamentals of Interpersonal Communication (3 0) Cr 3 F S SS Application of communication principles theory and research to an examination of the process of interpersonal communication and the improvement of communication skills that are most relevant to a broad range of interpersonal settings

214 Professional Communication (2-2) Cr 3 F S SS Theory and skill development in professional oral communication skills Emphasis on interactive communication competencies in leadership and supervision team and meeting management functional interviewing and team presentations

290 Special Projects Cr 1 to 2 each time taken maximum of 4 credits F S SS *Prereq 3 credits in communication studies permission of department chair*

310 Intercultural Communication (3-0) Cr 3 F *Prereq 101 or 102* Various cultural factors that affect the human communication process the interplay of culture language nonverbal cues values and person perception in intercultural encounters Development of intercultural communication competence

311 Interpersonal Communication (3-0) Cr 3 F S SS *Prereq 101 or 102* Theory and principles of communication in interpersonal settings perception verbal and nonverbal language the role of self and others in the communication process cultural and subcultural differences and rhetorical bases of effective communication

314 Organizational Communication (3-0) Cr 3 F *Prereq 101* Theory and research in organizational communication strategies for assessing and improving individual and organizational communication effectiveness and an understanding of how organizational meaning is created and sustained through human communication

317 Small Group Communication (2 2) Cr 3 F S SS *Prereq 101* Theories of communication applied to small group decision making and leadership Development of communication skills for group effectiveness

318 Conflict Management (3-0) Cr 3 S *Prereq 101 or 102* Communication theory principles and practice used in managing interpersonal and intergroup conflict

325 Nonverbal Communication (Sp Cm 325 Ling 325) See *Speech Communication*

414 Organizational Communication Training and Development (3 1) Cr 3 Alt S offered 1995 *Prereq 314 IEd T 302* Application of organizational communication theory and research to training and development functions in contemporary organizations

418 Theories of Small Group Communication (3 0) Cr 3 Alt S offered 1994 *Prereq 317* An in depth study of research and theory with emphasis on furthering understanding of communication

pertaining to small group processes including but not limited to group development leadership decision making and conflict

490 Independent Study Cr 1 to 3 each time taken maximum of 9 F S SS Only one independent study enrollment is permitted within the department per semester *Prereq 9 credits in communications studies junior classification permission of department chair*

493 Workshop Cr 1 to 3 each time offered F S SS *Prereq 12 credits in communication studies courses* Offered irregularly to explore special topics not adequately covered in other course offerings Materials fee

498 Senior Seminar (3-0) Cr 3 S *Prereq 15 credits in communication studies Stat 101 Psych 301 or Soc 302* Directed study of a communication issue identified by each student Students synthesize relevant theory and research culminating in a senior project/paper

499 Communication Internship Cr 1 to 8 each time taken maximum of 8 F S SS *Prereq 18 credits in communication studies other courses deemed appropriate by faculty adviser 2nd semester junior or senior standing cumulative GPA of at least 2 5 overall and 3 0 in communication studies and permission of the internship committee* ***Applications should be submitted in the term prior to the term in which the internship is desired*** Supervised application of communication in professional settings

Courses Primarily for Graduate Students, open to qualified undergraduates

504 Seminar Cr 1 to 3 each time taken F S SS *Prereq 9 credits in communication studies*
A Communication Theory and Research
B Interpersonal Communication
C Small Group Communication
D Organizational Communication
E Intercultural Communication

590 Special Topics Cr 1 to 4 each time taken maximum of 12 credits *Prereq Permission of department chair*

Interpersonal and Rhetorical Communication (Sp Cm)

Courses Primarily for Undergraduate Students

110 Listening (2-0) Cr 2 F S SS A course designed to (1) increase awareness of the impact of listening in daily interactions and (2) provide behaviors that can be applied to improve listening effectiveness

171 Improving Speech Effectiveness (CmDis 171) See *Communication Disorders*

212 Fundamentals of Public Speaking (3 0) Cr 3 F S SS Theory and practice of basic speech communication principles applied to public speaking Practice in the preparation and delivery of extemporaneous speeches

223 Intercollegiate Debate and Forensics Cr 1 each time taken maximum of 6 credits F S *Prereq Permission of instructor* Participation in intramural and intercollegiate debate and other forensic events

290 Special Projects Cr 1 to 2 each time taken maximum of 4 credits F S SS *Prereq 3 credits in speech communication permission of department chair*

305 Semantics (Lng 305) (3-0) Cr 3 F S SS *Prereq Engl 105* Nature of symbolic processes determination of meanings major approaches to linguistic study impact of verbal habits in human affairs relationships between language and thought in personal or social problems accuracy in use of verbal symbols

312 Business and Professional Speaking (3-0) Cr 3 F S SS *Prereq 212* Principles and competency development in the primary types of professional business presentations instructional persuasive reports briefings and business conferences

313 Communication for the Classroom Teacher (3-0) Cr 3 S SS *Prereq 212* Communication in the teaching profession training in classroom-oriented communication activities use of video recorder for analysis of presentation

321 Communication with the Elderly (Geron 321) (3-0) Cr 3 S Communication theory and practice presented with applications and strategies for interactions with elderly persons Interpersonal competencies in social conversations and interviewing developed

322 Argumentation and Debate (3 0) Cr 3 F SS *Prereq 212* Practice in preparing and presenting argumentative and debate speeches emphasis on ethical and logical duties of the advocate analysis evidence reasoning attack defense research case construction and judging

324 Legal Communication (3-0) Cr 3 Alt S offered 1994 *Prereq 212* Speech communication in the legal system inside and outside the trial process interviewing and counseling negotiating and bargaining *voir dire* opening statements examination of witnesses closing arguments judge s instructions jury behavior and appellate advocacy

325 Nonverbal Communication (Lng 325 ComSt 325) (3-0) Cr 3 F S SS *Prereq 101* Examination of nonverbal communication and the use of power liking disliking dominance and submissiveness Impact of nonverbal communication on social order and social structure Gender differences in nonverbal communication

327 Persuasion (3-0) Cr 3 F S SS *Prereq 212* Examination of behavioral research in persuasion scientific methods of evaluating persuasive communication emphasis on application of experimental research audience analysis attention perception suggestion logical emotional and ethical proofs

412 Rhetorical Criticism (3-0) Cr 3 F S *Prereq 212 and 6 credits in speech communication* Development of rhetorical theory and practice from Corax to modern times Application of principles of criticism to current public speaking practices

416 American Public Address (3-0) Cr 3 S Relationship between public persuasions and leaders process of preparing major public addresses selected speakers and speeches as linked with political or historical events

417 Campaign Rhetoric (Pol S 417) (3 0) Cr 3 Alt F offered 1994 *Prereq 212* Backgrounds of candidates for state and national elections selected *speeches and issues persuasive strategies and* techniques of individual speakers

490 Independent Study Cr 1 to 3 each time taken maximum of 9 F S SS Only one independent study enrollment is permitted within the department per semester *Prereq 9 credits in speech communication junior classification permission of department chair*

493 Workshop Cr var 1 to 3 each time offered F S SS *Prereq 12 credits in speech communication courses* Offered irregularly to explore special topics not adequately covered in other course offerings Materials fee

495A Directing Speech Activities (SecEd 495A) (1-0) Cr 1 S *Prereq SecEd 301 9 credits in speech communication minimum grade point of 2 5 in speech communication courses* Problems methods and materials related to directing speech activities in secondary schools

495B Teaching Speech (SecEd 495B) (3-0) Cr 3 F *Prereq SecEd 301 Sp Cm 313 9 credits in speech communication minimum grade point average of 2 5 in speech communication courses* Problems methods and materials related to teaching speech theatre and media in secondary schools

498 Senior Seminar (3-0) Cr 3 S *Prereq 15 credits in speech communication senior classification* Students synthesize relevant theory and research culminating in a senior project/paper

499 Communication Internship Cr var 1 to 8 each time taken maximum of 8 F S SS *Prereq 18 credits in speech communication courses other courses deemed appropriate by faculty adviser 2nd semester junior or senior standing cumulative GPA of at least 2 5 overall and 3 0 in speech communication and permission of the internship committee* ***Applications should be submitted in the term prior to the term in which the internship is desired*** Supervised application of interpersonal and rhetorical communication in professional settings

Courses Primarily for Graduate Students, open to qualified undergraduates

504 Seminar Cr 1 to 3 each time taken F S SS *Prereq 9 credits in speech communication* Topics may include the following
A Interpersonal and Rhetorical Communication
B Speech Education

510 Classical Rhetoric (3-0) Cr 3 S *Prereq 12 hours in speech communication* Greek and Roman tradition in rhetorical theory practice criticism and pedagogy

590 Special Topics Cr 1 to 4 each time taken maximum of 12 credits *Prereq Permission of department chair*

Statistics

Dean L Isaacson Head of Department

Professors Athreya Bailey D F Cox Cressie H A David H T David Fuller Groeneveld Harville Hinz Isaacson Kennedy Koehler Meeker Pollak Shelley Strahan Vardeman Wieand

Emeritus Professors C P Cox Hickman Hotchkiss Huntsberger Kempthorne Strand Wolins

Associate Professors Amemiya Lorenz Marasinghe Roberts Stephenson Stufken Sukhatme

Assistant Professors Baker Breidt Carriquiry, Kaiser Lahiri Nusser Rollins Sherman

Undergraduate Study

For the undergraduate curriculum in liberal arts and sciences major in statistics leading to the degree bachelor of science see *Liberal Arts and Sciences Curriculum*

The curriculum in liberal arts and sciences with a major in statistics is designed to prepare students for (1) entry level statistics positions requiring the B S degree in statistics in business or commerce nonprofit institutions and in state or federal government, (2) graduate study in statistics Entry level positions include the following types of work statistical design analysis and interpretation of experiments and surveys data processing and analysis using modern computation facilities and statistical computing systems application of statistical principles and methods to commercial areas such as finance insurance industrial research marketing manufacturing and quality control Nonprofit organizations such as large health study institutions have entry level positions for B S graduates in statistics Also there are opportunities for work in statistics that require a major in a subject-matter field and a minor in statistics

Undergraduate majors in this department usually include in their programs (a) Statistics 101 or an alternative introductory course (104 or 227) (b) Mathematics 165 166 265 307 (or 175 176 270 371) and Computer Science 205 and (c) Statistics 341 342 401 402 421 480 481

These courses plus at least two additional courses in statistics at the 400 level or above constitute the major With permission of the department I E/Stat 361 may be substituted for one of these courses It is advisable to have a minor in a field of application

The department offers a minor in statistics which may be earned by completing one of three options Option I 101 or 104 231 or 401 Option II 341 342 231 or 401 Option III 227 328 Additional courses in statistics at the 300 level or above are required for each option to yield a total of at least 15 credits in statistics courses

English proficiency requirement The department requires a grade of C– or better in Engl 104 and 105 (or 105H) and completion of one of Engl 204 302 or 314 with a grade of C- or better

Students intending to do graduate work in statistics normally would take additional courses in mathematics

Graduate Study

The department offers the degrees master of science and doctor of philosophy with a major in statistics and minor work for students majoring in other departments Within the statistics major the student may select areas of specialization in experimental design probability statistical methods statistical theory statistical computing survey sampling quality control spatial statistics time series reliability or applied statistics (e g biometrics econometrics psychometrics sociometrics etc) A major in operations research leading to a master of science degree is offered in cooperation with the Department of Industrial and Manufacturing Systems Engineering The doctor of philosophy degree is offered as a co-major with other departments Such departments have included Agronomy Animal Science Economics Forestry Genetics Industrial and Manufacturing Systems Engineering Mathematics Professional Studies in Education and Psychology

Prerequisite to major graduate work is the completion of an undergraduate curriculum essentially equivalent to the curriculum in liberal arts and sciences at this institution including at least a year of calculus

The degree master of science may be earned on either a thesis or nonthesis basis The nonthesis option requires the completion of at least 34 credits of acceptable graduate work including the completion of a creative component and satisfactory performance on a written examination

The department encourages students to prepare themselves in foreign languages and in computer languages but specific requirements for the degrees master of science and doctor of philosophy are at the discretion of the student s advisory committee

The department participates in the interdisciplinary program in business administrative sciences and in the interdepartmental major in genetics

Open to graduate students for minor credit only 328 333 361 401 402 403 404 407, 421 432 436 447 451 480 481

Courses Primarily for Undergraduate Students

100 Orientation in Statistics (1-0) Cr R F Opportunities challenges and the scope of the curriculum in statistics For students planning or considering a career in this area

***101 Principles of Statistics** (3 2) Cr 4 F S SS *Prereq 1½ years of high school algebra* Statistical concepts in modern society descriptive statistics and graphical displays of data the normal distribution elements of statistical inference estimation and hypothesis testing linear regression and correlation contingency tables

***104 Introduction to Statistics** (2-2) Cr 3 F S SS *Prereq 1½ years of high school algebra* Statistical concepts with emphasis on experimental problems from biological fields Summarizing statistical data the normal distribution estimation and tests of hypotheses regression and correlation analysis simple analysis of variance For students in the agricultural and biological sciences

***105 Introduction to Statistics for Engineers** (3-0) Cr 3 F S *Prereq Math 165 or 175* Statistical concepts with emphasis on engineering applications Data collection descriptive statistics probability distributions and their properties elements of statistical inference regression statistical quality control charts

***201 Applied Regression Analysis for Business** (2-0) Cr 2 F *Prereq 101 or 104 or 105* Brief review of required descriptive and inferential statistics simple linear regression analysis multiple regression analysis diagnostic checking and model building application of regression techniques to analysis of variance and time series analysis

***227 Introduction to Business Statistics** (4 2) Cr 5 F S SS *Prereq Math 150 or 165* Obtaining presenting and organizing statistical data measures of location and dispersion probability concepts the normal distribution sampling and sampling distributions estimation and tests of hypotheses simple linear regression analysis multiple regression analysis

231 Probability and Statistical Inference for Engineers (4-0) Cr 4 F S *Prereq Math 166 or 176* Emphasis on engineering applications Basic probability random variables and probability distributions joint and sampling distributions propagation of error Descriptive statistics confidence intervals hypothesis testing simple linear regression multiple linear regression one way analysis of variance use of statistical software on the university computer

305 Engineering Statistics (3-0) Cr 3 F S *Prereq Math 165 or 175* Statistics for engineering problem solving with emphasis on the design and analysis of experiments Descriptive statistics elementary probability distributions principles of experimentation confidence intervals and significance tests one two- and many factor studies regression analysis Use of statistical software on the university computer

328 Applied Business Statistics (2-2) Cr 3 F S *Prereq 201 or 227 or 401* Application of statistical methods to problems in business and economics review of multiple regression residual analysis model building analysis of variance introduction to experimental design concepts time series analysis and forecasting

333 Probability and Statistics for Electrical and Computer Engineers (3 0) Cr 3 F S *Prereq Math 267 or 371* An accelerated introduction to applied probability and statistical methods including applications in reliability quality control systems theory and signal processing Descriptive statistics and exploratory data analysis basic probability random variables and probability distributions elementary reliability modeling joint and sampling distributions error propagation formulas Maximum likelihood model fitting confidence tolerance and prediction intervals hypothesis testing Shewhart control charts one way analyses regression analysis introduction to random processes

****341 342 Introduction to Theory of Probability and Statistics** (Math 341 342) (3-0) Cr 3 each 341 F S 342 S *Prereq 341 Math 265 or 371 342 341 Math 307* Probability distribution functions and their properties sampling distributions theory of estimation and tests of hypotheses linear hypothesis theory regression and correlation Enumerative data nonparametric methods

361 Quality Control (I E 361) See *Industrial Engineering*

398 Cooperative Education Cr R *Prereq Permission of department head* Off-campus work periods for undergraduate students in a field of statistics

401 Statistical Methods for Research Workers (3 2) Cr 4 F S SS *Prereq 101 or 104 or 201 or 227 Graduate students without an equivalent course should contact the department* Methods of analyzing and interpreting experimental and survey data Statistical concepts and models estimation hypothesis tests with continuous and discrete data simple and multiple linear regression and correlation introduction to analysis of variance

402 Statistical Design and the Analysis of Experiments (3-0) Cr 3 F S *Prereq 401* The role of statistics in research and the principles of experimental design Experimental units randomization replication blocking subdividing and repeatedly measuring experimental units factorial treatment designs and confounding extensions of the analysis of variance to cover general crossed and nested classifications and models that include both classificatory and continuous factors

403 Nonparametric Statistical Methods (2-0) Cr 2 Alt F offered 1994 *Prereq 231 or 328 or 401* Groeneveld Analysis of data when dependent variable has ordinal or nominal properties statistical inference for ranked data rank correlation efficiency of nonparametric procedures and robustness of comparable parametric procedures

404 Statistics for the Social Sciences (2 2) Cr 3 F *Prereq 401* Lorenz Roberts Applications of generalized linear regression models to social science data Assumptions of regression diagnostics and transformations analysis of variance and covariance path analysis

407 Methods of Multivariate Analysis (2-0) Cr 2 F *Prereq 401 knowledge of matrix algebra* Techniques of analyzing multivariate data including Hotelling s T^2 multivariate analysis of variance principal components cluster analysis

421 Survey Sampling Techniques (2-2) Cr 3 S *Prereq 231 or 328 or 401* Methods of designing and analyzing survey investigations simple random stratified and multistage sampling designs methods of estimation including ratio and regression construction and use of sample frames

432 Applied Probability Models (3 0) Cr 3 Alt F offered 1993 *Prereq 231 or 341* Groeneveld Probabilistic models in engineering and the physical sciences probability Markov chains Poisson and renewal processes applications to queueing scheduling control and other quantitative problems

436 Quantitative Genetics (3-0) Cr 3 S *Prereq 401* Bailey Introduction to Quantitative Genetics (QG) Basic concepts of population genetics as they relate to QG Derivation definition and estimation of QG parameters Genotype by environment interaction Application of statistical models to the design analysis and interpretation of QG experiments Genetic and statistical implications of natural and artificial selection procedures

****447 Statistical Theory for Research Workers** (4-0) Cr 4 S SS *Prereq Math 151 and permission*

of instructor or Math 265 Amemiya H A David Primarily for graduate students not majoring in statistics Emphasis on aspects of the theory underlying statistical methods Probability population distributions and their properties sampling distributions estimation tests of hypotheses regression introduction to analysis of variance

451 Applied Time Series (3 0) Cr 3 S *Prereq 231 or 328 or 401* Meeker Methods for analyzing data collected over time review of multiple regression analysis Elementary forecasting methods moving averages and exponential smoothing Autoregressive moving average (Box Jenkins) models identification estimation diagnostic checking and forecasting Transfer function models and intervention analysis

480 Statistical Applications of Digital Computers (3 0) Cr 3 F *Prereq 101 or 104 or credit or enrollment in 401 Com S 205 or knowledge of FORTRAN* Marasinghe Techniques of programming for statistical applications Programming in algorithmic languages Efficiency and numerical accuracy in algorithms Introduction to Monte Carlo methods statistical techniques in simulation and numerical methods in statistical computing

481 Computer Processing of Statistical Data (3-0) Cr 3 S *Prereq 401* Marasinghe The computer as a tool for statistical data analysis Introduction to graphical methods in data analysis and a matrix programming language Structure and content of statistical packages Advanced techniques in use of statistical software systems classification methods

490 Independent Study Cr var *Prereq 10 credits in statistics No more than 9 credits in Stat 490 may be counted toward graduation*
H Honors

493 Workshop in Statistics (1 0 or 2-0) Cr 1 or 2 Off campus offered as demand warrants *Prereq 101 or 104 or 227* Planning executing and interpreting experiments by understanding experimental design and utilizing the statistical concepts of linear models Designed for master of agriculture program only

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*Credit for only one of the following courses may be applied toward graduation 101 104 105 227 Credit for both 201 and 227 may not be applied toward graduation

**Credit for both 341 and 447 may not be applied toward graduation

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Statistical Methods (3-2) Cr 4 F *Prereq 101 and credit or enrollment in 579* Hinz Koehler Introduction to methods and analyzing data from experiments and surveys Methods of analysis of variance including cross classifications correlation multiple regression covariance contingency table analysis Current computer software utilized in data analyses

501 Multivariate Statistical Methods (3 0) Cr 3 S *Prereq 500 or 402 447 or 542 knowledge of matrix algebra* Koehler Elementary theory and techniques of analyzing multivariate data including Hotelling s T^2 multivariate analysis of variance principal components linear discrimination canonical correlation factor analysis cluster analysis classification methods

511 Theory and Application of Linear Models (3-0) Cr 3 S *Prereq 500 or 402 or 404 542 or 447 a course in matrix algebra* Harville Stufken Standard functional and classificatory models matrix preliminaries estimability intermediate theory of least squares and of best linear unbiased estimation analysis of variance and covariance distribution of quadratic forms variance components

512 Design of Experiments (3-0) Cr 3 F *Prereq 511* Harville Stufken Basic ideas of experimental design with applications completely randomized randomized block and Latin Square designs randomization analysis factorial experiments confounding fractional replication split plot and incomplete block designs basic ideas of optimal design

513 Response Surface Methodology (3 0) Cr 3 Alt S offered 1994 *Prereq 402 or 512 knowledge of elementary matrix theory* Harville Stufken Design criteria and optimality determination of optimum operating conditions exploration of response surfaces mixture experiments construction of optimal designs

514 Scheduling and Inventory Theory (I E 514) See *Industrial Engineering*

521 Theory of Sample Surveys (3-0) Cr 3 S *Prereq 401 447 or 542* Breidt Basic concepts and theory of designing sample surveys for finite populations estimation of means totals proportions variances and covariances frequently used designs such as simple random stratified systematic cluster and multistage sampling ratio and regression methods of estimation

531 Statistics for Quality and Productivity (I E 531) (3-0) Cr 3 Alt S offered 1995 *Prereq 342 or 447* Vardeman Statistical methods and theory applicable to problems of product quality and productivity Shewhart CUSUM and other control charts feedback control process capability studies estimation of product and process characteristics experimental techniques in robust product design troubleshooting and process improvement acceptance sampling continuous sampling and sequential sampling economic and decision theoretic arguments in industrial statistics

533 Reliability (I E 533) (3 0) Cr 3 Alt S offered 1994 *Prereq 342 or 432 or 447* H T David Meeker Probabilistic modeling and inference in reliability analysis of systems product limit estimator maximum likelihood estimation for censored data accelerated failure time and proportional hazards regression models applications

534 Ecological Statistics (2-0) Cr 2 Alt S offered 1995 *Prereq 447 or 542* Pollak Models of population growth growth of populations with two competing species parasite-host and predator prey relationships elementary population genetics selection mutation and migration spatial patterns in populations with one or more species diversity information theory

535 Biological Statistics (2-0) Cr 2 Alt S offered 1995 *Prereq 401 or 500* Estimations from standard curves Sigmoidal dose response curves Design and analysis of direct parallel line slope-ratio and quantal response assays Immunoassays Fitting the Michaelis Menten equation and the examination of other biostatistical problems according to student interests

536 537 Genetic Statistics (Gen 536 537) (2-0) Cr 2 each 536 Alt F offered 1993 537 Alt S offered 1994 *Prereq 536 401 447 Gen 320 or 330 and permission of instructor 537 536* Pollak Probability applied to genetic systems random mating selection and mutation theory of inbreeding some effects of finite population size models for quantitative inheritance partition of genotypic variance covariances among relatives with random mating and selfing experimental designs for evaluating parameters phenotypic selection for quantitative traits

538 Econometric Statistics (Econ 538) (3-0) Cr 3 F *Prereq 447* Amemiya Fuller Generalized linear regression Dummy variables nonlinear regression and prediction Measurement error models Simultaneous equation systems Regression equations with autoregressive errors

539 Game Theory (Econ 539 I E 539) (3-0) Cr 3 F *Prereq 341 or 432 or 447* H T David Zero-sum two person games games of timing relation to mathematical programming non-cooperative and cooperative n person games

540 Operations Research Methods and Economic Analysis (Econ 540 I E 540) (3 0) Cr 3 S *Prereq 447 or I E 312 or Econ 537* Methods and applications of selected techniques in nonlinear programming including linear convex and quadratic programming Applications in economics statistics and operations research

542 543 Theory of Probability and Statistics (3-0) Cr 3 each Yr *Prereq 542 341 Math 414 or 465 543 542* Sample spaces events probability expectation moments inequalities conditional probability common distributions moment generating and characteristic functions elementary limit theorems order statistics sampling distributions multivariate normal distribution point estimation sufficiency completeness exponential family confidence intervals Neyman Pearson lemma UMP tests likelihood ratio tests sequential testing elementary decision theory and nonparametric inference

544 Bayesian Decision Theory (3 0) Cr 3 Alt SS offered 1994 *Prereq 543* Introduction to decision theory risk sets admissible strategies Bayes strategies complete classes conjugate priors comparison of Bayesian and classical theories exchangeability

546 Theory of Nonparametric and Asymptotic Methods (3 0) Cr 3 Alt S offered 1995 *Prereq 542* Sukhatme Introduction to nonparametric problems 1 sample 2 sample and c sample problems tests based upon sample distribution functions K S and C S tests rank tests tests for location scale and independence local properties of rank tests Convergence of a sequence of random variables limit theorems asymptotic distributions of sample quantiles U statistics rank statistics chi square and other goodness of fit test statistics asymptotic efficiency of tests

554 Introduction to Stochastic Processes (Math 554) See *Mathematics*

555 Theory of Stochastic Processes (Math 555) See *Mathematics*

557 Statistical Methods for Counts and Proportions (3 0) Cr 3 Alt F offered 1994 *Prereq 500 or 401 542 or 447* Koehler Introduction to statistical methods for analyzing categorical responses including chi square tests measures of association log linear and logistic regression models repeated measures methods for complex surveys correspondence analysis Asymptotic properties of estimators Current computer software

579 Introduction to Computer Hardware and Software Systems for Statistical Computing (1-0) Cr 1 F *Prereq Graduate classification in statistics* Kennedy Marasinghe Designed to introduce students to the languages and conventions required for the use of the leading software systems in statistical computing Offered only on a satisfactory fail basis

580 Statistical Computing (3-0) Cr 3 F *Prereq 500 542 and knowledge of a scientific programming language* Kennedy Seminumerical numerical and nonnumerical methods used in statistical computing Application areas discussed include probability function approximation simulation and linear and nonlinear least squares methods

590 Special Topics Cr var
A Theory
B Methods
C Design of Experiments
D Design of Surveys

599 Creative Component

Courses for Graduate Students, major or minor

601 Advanced Statistical Methods (3 0) Cr 3 Alt S offered 1995 *Prereq 500 Math 514* Topics selected from explanatory methods for high dimensional data graphical methods nonparametric smoothing robust methods analysis of nonlinear models resampling methods applied Bayesian methods

606 Spatial Statistics (3 0) Cr 3 Alt S offered 1994 *Prereq 511 543* Cressie General spatial model spatial data analysis continuous spatial

variation geostatistics kriging lattice data conditional models joint models image analysis point patterns randomness clustering random sets

611 Advanced Linear Model Theory (3-0) Cr 3 F *Prereq 511 543 course in matrix algebra* Harville Advanced theory of least squares and best linear unbiased estimation non central chi square and F distributions distribution of linear and quadratic forms F test confidence regions extensions of best linear unbiased estimation theory to mixed and random models and to non-standard settings biased estimation recursive estimation inference for variance components

612 Advanced Design of Experiments (3-0) Cr 3 Alt S offered 1995 *Prereq 512* Stufken Design optimality criteria and optimal designs Galois fields and finite geometries with applications to design construction fractional factorial designs theory of approximate designs and the equivalence theorem changeover designs with applications

621 Advanced Theory of Survey Sampling (3 0) Cr 3 Alt S offered 1995 *Prereq 521* Breidt Advanced topics of current interest in design of surveys and analysis of survey data unequal probability sampling with and without replacement criteria for choice of survey strategies including sufficiency likelihood and admissibility super population models and their role in choice of optimal strategies review of recent literature

642 Advanced Probability Theory (3-0) Cr 3 S *Prereq 542 Math 514* Athreya Probability spaces Kolmogorov s consistency theorem moments convergence in distribution uniform integrability weak and strong laws of large numbers characteristic functions central limit theorem and its ramifications and discrete parameter martingales

643 Theory of Estimation and Testing of Hypotheses (3 0) Cr 3 F *Prereq 543 642* Cressie Lahiri Asymptotic theory of maximum likelihood estimation elements of decision theory sufficiency unbiased estimation Neyman Pearson theory of testing hypotheses invariance

645 Order Statistics (3-0) Cr 3 Alt F offered 1993 *Prereq 543* H A David Distribution theory and moments of order statistics estimation of location and scale parameters censoring robust estimation treatment of outliers asymptotic distributions of quantiles extremes and linear functions of order statistics

647 Multivariate Analysis (3-0) Cr 3 F *Prereq 543* Amemiya Multivariate normal distribution Wishart distribution multiple partial and canonical correlations inference for mean vector multivariate regression principal components discriminant analysis factor analysis covariance structure analysis

648 Seminar on Theory of Statistics and Probability Cr var *Prereq 543*

651 Time Series (Econ 651) (3 0) Cr 3 Alt S offered 1994 *Prereq 642* Fuller Covariance and spectral representation of time series Stationary and nonstationary autoregressive models Fourier and periodogram analyses Stochastic difference equations Estimation and distribution theory

680 Advanced Statistical Computing (3-0) Cr 3 S *Prereq 580* Kennedy Selected methods and algorithms in selected areas of statistical computing Emphasis on the most recent advances in these and other areas supported by statistical computing

699 Research

Teacher Education

Norene F Daly Director Teacher Education and Dean College of Education

All students who are recommended by Iowa State University for teacher licensure must meet the requirements of the teacher education program and be recommended by the College of Education An undergraduate seeking a bachelor s degree must be enrolled in the department in which he or she plans to major and must meet the graduation requirements of that department and the college in which it is located Students already holding a bachelor s degree should consult with the coordinator of the area in which they plan to specialize so that an individualized program of study can be developed

Admission to Undergraduate Teacher Education Program

A student seeking admission to a teacher education program must be accepted by a selection committee for the specific program which he or she seeks to enter Factors considered in evaluating applications include scholarship interest in teaching character and physical and mental health Recommendations by selection committees must be confirmed by the University Teacher Education Committee before admission to the program in teacher education is granted

Students *may* apply as early as four semesters before the one in which they plan to enroll for student teaching however they *must* be fully admitted into the Teacher Education Program by mid-semester prior to their planned student teaching semester A 2 5 grade-point average is required for full admission to the teacher education program and this minimum average must be maintained through graduation In addition admission to the university teacher education program shall require a minimum composite score of 19 on the ACT or minimum scores on the reading writing and mathematics subtests of the PPST of 172 172 and 170 respectively (Details regarding the dates and fees for the tests are available through Student Services in E105 Lagomarcino)

Teacher Licensure

The Iowa Provisional License may be recommended for those who hold the bachelor s degree from Iowa State and who have completed the following

1 All requirements of an approved teacher education program including the human relations requirement of SecEd/El Ed 406 and one additional course designated as appropriate for the human relations requirement

2 A minimum of 42 semester hours in courses designed to serve the general needs of college students This total will include Engl 104 and 105 one course appropriate for developing interpersonal or group presentation skills * Psych 230 Lib 160, one course in mathematics and one course in American history or American government

Approval for the *prekindergarten-kindergarten license* and/or the *early childhood special education license* requires the successful completion of the licensure curriculum in the Department of Human Development and Family Studies

Approval for the *early childhood education license* requires successful completion of the licensure curriculum through either the Department of Curriculum and Instruction or the Department of Human Development and Family Studies

Graduate programs are available for those who seek approval as elementary and secondary school principals superintendents counselors instructional media specialists or teachers in junior and community colleges Students also may pursue a program for approval to teach in the area of learning disabilities and/or emotional disabilities

Approval for the school psychologist licen se requires the successful completion of that graduate program in the Department of Psychology

Information concerning licenses not described above as well as more detailed requirements for any license may be obtained from the Student Services Office in the College of Education

The General Education Requirement

All prospective teachers are required to complete a program in general education which is integrated with their professional training and extends through the undergraduate curriculum
The student is expected to complete studies in five groups in general education Usually courses relating to a given area may be found in several different departments Credits listed are minimum requirements

Cr	
9	I Biological sciences physical sciences and mathematics
9	II Social sciences
6	III Humanities
9	IV Communication skills
1	V Health dance physical education safety
34	
8	Additional credits in above areas
42	Total

A student must have 42 semester hours in general education outside his or her academic major or minor with the minimum in each area as shown above This total will include Engl 104 and 105 one course appropriate for developing interpersonal or group presentation skills* Psych 230 Lib 160 one course in mathematics and one course in American history or government Additional credits in general education may be required by departments preparing teachers

*See college or department list for appropriate courses

The Professional Teacher Education Requirement

As part of a total educational program the prospective teacher must complete certain studies related directly to the profession of teaching All students in teacher education (elementary and secondary) must take the following courses

Cr	
3	SecEd/El Ed 204—Social Foundations of American Education
1	SecEd/El Ed 301—Instructional Media
3	Psych 333—Educational Psychology

2 SecEd/El Ed 406—Multicultural Awareness and Non-sexism in the Classroom
2-3 One additional course designated as appropriate for the human relations requirement A list of approved courses is available from the Student Services Office in E105 Lagomarcino Hall
12-16 Student teaching (minimum—12 weeks)

Additionally all students must satisfactorily complete at least one credit of pre-student teaching laboratory experience This requirement may be met through a pre-student teaching course (e g SecEd 280) or, in certain subject areas a course designated to provide an equivalent experience

Secondary education students must also complete the following courses

R SecEd 415—Senior Seminar
3 or 4 SecEd 426—Principles of Secondary Education

Professional Courses in Areas of Specialization

AgEdS—211, 310, 410 411 417
Biology—LAS 417D 492
Chemistry—LAS 417B 492
Earth Sciences—LAS 417J 492
English—Engl 493 494 LAS 417E, 480E
Foreign Languages—F Lng 496 LAS 417G
General Science—LAS 417B 492
Health Education—H S 375 417
Home Economics Education—FCSED 206 206L 310 310L 318 413 413L 417A 417B 420
Mathematics—LAS 417C Math 497
Music—LAS 417K and/or 417L Music 464 or 465 466
Physical Education—P E 375 417 418 475
Physical Sciences—LAS 417B 492
Physics—LAS 417B 492
History and Social Sciences—LAS 417A 493A 493B
Speech Communication—LAS 417F Sp Cm 495A 495B

The Requirements for Areas of Specialization in Teacher Education

A teacher must also be competent in the area of a teaching specialization For instance certain competencies are required of those who would teach at the prekindergarten-kindergarten or the elementary level Those preparing to teach at the secondary level must develop a depth of understanding in one or more subject matter areas

For *full-time teaching in secondary schools* an approved subject matter concentration of at least 30 semester hours is required Additional subject matter areas usually consisting of 24 semester hours each are possible but not required Students interested in adding a second subject area should consult with the coordinator of the area

The additional courses required by specific teaching areas are

Agricultural Sciences and Agribusiness

See *Curriculum Agricultural Education*

Art

See *Curriculum Art Education Department of Art and Design B F A*

Biology

Coordinator George Knaphus

Students seeking approval to teach biology must earn 13 credits in chemistry 8 in physics and at least 6 in mathematics and take the following biological courses
Biol 201 201L 202 202L 301 301L 302 302L 312 and 403
Bot 306
MIPM 202
Zool 355
Six additional credits at the 300 level or above in a basic biological science A course emphasizing concepts in biotechnology is recommended but not required

Students who have begun their biological science program under earlier catalogs need to see the science teaching adviser if they have questions

Chemistry

Coordinator Thomas Greenbowe

Students seeking approval to teach chemistry must earn credits in the following courses
General chemistry 177 177L 178
Analytical chemistry 210 or 211 and 316
Organic chemistry 331 332, 333A 334A
Inorganic chemistry 301
Physical chemistry 321 321L 322
Math 165 166
Phys 221 222 or 111 112

Strongly recommmended but not required
Biol 201 201L

Coaching Interscholastic Athletics

Coordinator Julia Kiyoguchi

Students seeking the Iowa State University Physical Education endorsement to coach interscholastic athletics must

a Satisfy the professional teacher education requirements of the College of Education

b Satisfy the requirements of a teaching specialization area

c Earn credits in the following Zool 155 156 P E 220 355 (Prereq Phys 101 or 106 or 111) 365 402 455 486 and a minimum of 2 credits selected from P E courses numbered 301-311

Curriculum and Instruction

Elementary Education See *Curriculum Curriculum and Instruction*
Early Childhood Education See *Curriculum Curriculum and Instruction*

Earth Sciences

Coordinator Frederick DeLuca

Students seeking approval to teach earth sciences must earn credits in the following courses
Geol 100 100L 102 302 311 313 365 366
Mteor 206
Astro 120 150
Geog 100
Chem 163 163L, 164 164L
Phys 111 112
Math 151 or 160 or 165 or 175
and one course in biology

Students with an endorsement in a natural science who seek approval to teach earth sciences as an additional area must earn credits in the following courses
Geol 100 100L 102
Mteor 206
Astro 120
Geog 100
Courses 300 or above—3 credits

Students with no other natural science endorsement but who seek endorsement in this area must take the listed courses plus additional credits in this area to give a total of 24 See area coordinator for approval prior to taking courses

English

Coordinator Brenda Daly

Students seeking endorsement to teach English (7-12) must earn 46 credits in the following courses
Distributed Requirements
13 English Studies 199 210 219 310 339 or 350
3 Advanced writing (selected from 302 303 304 305 306 307 309 314 315 316)
3 British literature (selected from 373 374 375 376 377 378 379)
3 American literature (selected from 360 361 362 363 364)
3 Women s and/or minority literature (selected from 340 345 346 347, 348 349) (or 301 366 389 489 when appropriate)
21 English Education 220 394 353 or 354 420 493 494 Sec Ed 395

Students seeking to add English as an additional endorsement area must earn 33 credits in the following courses
3 Sp Cm 212 or Thtre 358
3 Advanced writing (selected from 302 303 304 305 306 307 309 314 315 316) 210
9 English Studies 210 219 or 220 310
3 British literature (selected from 373 374 376 377 378 379)
3 American literature (selected from 360 361 362 363 364)
3 World women s or minority literature (selected from 340 345 346 347 348 349 353, 354),
12 English education 301 or 394 493 494 SecEd 395

English as a Second Language

Coordinator Roberta Vann

Students seeking a K-12 endorsement to teach English as a second language as an additional area must earn 24 credits in English as a Second Language by taking one course from each of the six areas listed below and two additional courses from any of those listed
Teaching ESL Engl 495/518 or 588
Applied linguistics Engl 220 or 520
Language in culture ComSt 310 Anthr 309 or 500
Bilingual education Engl 514
Nature of language Engl 219 or 419/516 or 420 or 511 or 512 or 515
Language acquisition Engl 425 or 513 or 517
Additional ESL 6 credits taken from the courses listed above

See department for list of experimental courses that may be used as alternatives for some of the courses listed here

Family and Consumer Sciences

See *Curriculum Home Economics Education*

Foreign Languages and Literatures

Coordinator Walter Chatfield

Students seeking approval to teach a foreign language must earn at least 34 credits in that one foreign language which must include the courses indicated below for that language Licensure full or restricted also requires Foreign Language 496

French 301 302 305 or 306 321 or 331 322 or 332 401

German 301 302 305 330 401 4 credits from 421 or 422

Spanish 301 303 314 401 403 6 credits from 321 322 330 331 332

Latin 306 (2 cr) 6 cr each in 441 442 5 cr arranged Hist (Cl St) 403

Russian 301 302, 321 322 401 402

The Department of Foreign Languages and Literatures requires that all students seeking approval to teach a modern language demonstrate adequate speaking proficiency in that language

Students seeking approval to teach one of the above foreign languages as an additional area must earn 25 credits in that language 9 of these credits must be at the 300 level or above with 6 of these credits in composition and conversation at the 300 or 400 level In Latin 10 credits must be at the 300 or 400 level and Hist 403 (Cl St 403) is required F lng 496 is also required for this licensure

Students seeking approval to teach Greek or Portuguese as an additional language must take 25 credits in the language 19 of these credits must be 300 level courses or above Endorsement in Greek also requires History 402 F Lng 496 is also required for this licensure

General Science

Coordinators Frederick DeLuca James Dixon Thomas Greenbowe George Knaphus

Students seeking approval to teach general science must earn credits in the following courses
Biol 201 201L 202 202L
Bot 207
Chem 163 163L 231 232
Geol 100 100L
Phys 111 112 or 221 222
Math 151 or 160 or 165 or 175

At least 6 credits from courses numbered 300 or above in astronomy and astrophysics biochemistry and biophysics biology botany chemistry genetics geology meteorology microbiology physics and zoology

Health Education

Coordinator Frank Schabel

Students seeking approval to teach *health education* must earn credits in the following courses H S 110 215 305 310 350 390 FS HN 167 P E 258 HD FS 276, HD FS 102 or 373 or 377 Zool 155 156

Students seeking approval for *health education* as an additional subject area must earn credits in the following courses H S 110 215 305 310 350 390 FS HN 167 HD FS 276 Zool 155 156

History and Social Sciences

Coordinator Clair Keller

Students seeking certification in any of the social studies areas must complete 15 credits from the following courses listed in each of at least two approval areas plus (a) 15 credits distributed among any of the remaining areas or (b) 15 credits taken from a single additional area For each additional area of certification students must complete 15 credits from courses listed

Courses applicable in specific areas

Anthropology Anthr 201, 202, 306 or 309 307 or 308 and any other Anthr course

Economics *Econ 201 or 205 and 206* 301 302 304 306 310 312 355 404, 405 446 461 465

Geography Geog 100 324 325 326 328, Anthr 322 323 325 326

Political Science Credits as needed from Pol S 215 230 241 251 305, 306 310 311 320 344 357 358 360 361 371 385 * 405 406 410 413 420 421 433 453 464 471

Sociology Soc 130 or 134 and credits as needed from 201 235 302 305 310 327 * 330 331 340 345 377 380 381 401 411 415 420 425 435 461 473, 484, 485

United States History Credits as needed with at least two courses from groups 1 and 2 and one course from group 3
Group 1 221 351 381 450 451 452, 454 455, 462 465, 467
Group 2 222 352 457 458 459 463 464 467 470 471
Group 3 353 * 354 * 370 375 382 386 * 460 461, 472 488 489

World History Credits as needed with at least one course from each group
Group 1 201 304 325 401 402, 403 405 406 407 408 427 428
Group 2 202 305 326 381 410 411 412 414, 417 419 421 422 424 426 430 431
Group 3 207 208 311 336, 337 338 340 341, 441

Students who have approval in other subjects and who wish additional approval to teach a specific area of the social studies must take LAS 493A and complete 24 semester credits in the area of approval or 15 semester credits in an approval area plus 15 semester credits from one additional area or distributed from other social studies areas

Human Development and Family Studies

Early Childhood Education See *Curriculum Human Development and Family Studies*
Early Childhood Special Education See *Curriculum Human Development and Family Studies*
Prekindergarten-Kindergarten Education See *Curriculum Human Development and Family Studies*

Mathematics

Coordinator William Rudolph

Students seeking approval to teach mathematics must earn credits in the following courses Math 165 166, or 175 176 301, 270 or 302 or 307 or 317 435 436 489 Com S 107 or 207 or 227 Math 304 or Stat 341 plus an additional 6 credits in courses numbered 200 or above in mathematics computer science (except Com S 201) or statistics (except Stat 227 or 228)

Students seeking approval to teach mathematics as an additional area must earn credits in the following courses Math 165 166 or 175 176 301 270 or 307 or 302 or 317 435 489 Com S 107 or 207 or 227 Math 304 or Stat 341

Music

Coordinator Grant Newman

Students seeking approval to teach music must earn credits in the following courses Music 119 120 219 233 234, 235 236 266 319 333 334 335 336 361 362 419 3 credits of advanced music history and 3 credits of advanced music theory

Music 360, 465 and 466 are required for students planning to teach vocal music

Music 350 351 352 353 354 355 356 464 466 are required for students planning to teach instrumental music

Physical Education

See *Curriculum Physical Education*

Physical Sciences

Coordinators Frederick DeLuca James Dixon Thomas Greenbowe

Students seeking approval to teach physical sciences must earn credits in the following courses

Astro 120 150 or 342 346
Chem 163 163L 231 232
Geol 100 100L
Mteor 206
Phys 111, 112 or 221 222
Biology one course
Math 151 or 160 or 165 or 175
Three credits from courses numbered 300 and above in astronomy and astrophysics chemistry meteorology physics, and geology

Students with an endorsement in a natural science who seek approval to teach physical sciences as an additional area must earn credits in the courses listed below Students with no other science endorsement but who seek an endorsement in this area, must take the listed courses plus additional credits in the area to yield a total of at least 24 See area coordinator for approval prior to taking additional courses
Astro 120 or 150 or 342 or 346
Chem 163 163L
Geol 100 100L
Mteor 206
Phys 111 112 or 221 222

Physics

Coordinator James E Dixon

Students seeking approval to teach physics must earn credits in the following courses Phys 221 222 311T 399 (2 cr) 321 or 324 and at least 12 credits from Phys 271 272 302 304 306 310 321L 322 322L 361 364 365 396 Astro 342, 344L 346 Chem 321 322 324 325 E E 205, 235, 441 E M 274 301 345 378 M E 330 331

Students with an endorsement in a natural science who seek approval to teach physics as an additional area must complete one of the following sets of courses
Phys 221 222 311T 321 321L 399 (2 cr) or Phys 111 112 302 311T 399 (2 cr)

Students with no other natural science endorsement who seek approval to teach physics as an additional area must complete one of the two sets of courses listed above plus sufficient additional credits from the following list of courses to total 24 credits Phys 221 222 271 272 302 304 306 310 321 321L 322 322L 324 Astro 342 344L 346 Chem 321 322 324 325 E E 205, 235 441 E M 274 301 345 378 M E 330 331

Reading

Coordinator Maribeth Henney

Students seeking endorsement to teach reading (7-12) as an additional area must earn credits in the following courses Engl 219 394, Engl 204 or 302 or 304 or 305 or 306 or 404 or 405 El Ed 375 475 SecEd 395 396 Students seeking reading approval for grades K-6 see elementary education adviser

Speech Communication

Coordinator Paul Kaufmann

Students seeking approval to teach speech must earn credits in the following courses CmDis 275 ComSt 101 or 102 311 Sp Cm 110 212 305 313 322 412 495A 495B Thtre 255 358 360 455 JI MC 101

*Courses acceptable to fulfill human relations requirement

Advisers for Areas of Specialization in Teacher Education

Persons interested in teaching in one of the following areas should consult with the appropriate individual Details of each area will be found in the appropriate departmental section

Elementary Education—Ann Thompson
Early Childhood Education—Maribeth Henney
Special Education/Learning Disabilities—Dale Baum
Special Education/Behavioral Disorders—Geoffrey Abelson

Prekindergarten-Kindergarten
Early Childhood Education—Susan Hegland
Special Education/Early Childhood—Susan McBride
Human Development and Family Studies—Shirley Karas

Secondary Education
Agricultural Education—Richard Carter
Art—Dennis Dake
Biology—George Knaphus
Chemistry—Thomas Greenbowe
Coaching Interscholastic Athletics—Julia Kiyoguchi
Earth Sciences—Frederick DeLuca
English—Brenda Daly
English as a Second Language—Roberta Vann
Foreign Languages—Walter Chatfield
General Science—Frederick DeLuca, James Dixon Thomas Greenbowe George Knaphus
Health Education—Frank Schabel
History and Social Sciences (economics sociology government geography and history)—Clair Keller
Home Economics Education—Rosalie Amos
Mathematics—William Rudolph
Music—Grant Newman
Physical Education—Shirley Wood
Physical Sciences—Frederick DeLuca James Dixon Thomas Greenbowe
Physics—James E Dixon
Reading—Maribeth Henney
Speech Communication—Paul Kaufmann

Technology and Social Change

(Interdepartmental Minor)

Supervisory Committee Eric A Abbott Chair K E Gwiasda G G Karas S Marley R Mazur S K Williams

Advisory Committee E A Abbott Chair G W Beran T Chacko D Cowan D Grosvenor K E Gwiasda (vice-chair) S Huang E C Jones G G Karas G Klonglan J Knox M A Littrell A Marcus S Marley (vice-chair) R Mazur (vice-chair) W Meyers M Rahman S Sapp S Schmidt D Shinn A A Smith M Thompson R Van Iten, D M Warren D L Williams S K Williams K Whigham W Wolansky

Undergraduate Study

Technology and social change is a cross-disciplinary program in which students may develop a minor or an area of concentration The program provides students an opportunity to examine the institutional and sociocultural consequences of technological change from differing perspectives and to become sensitive to the issues attending the use of technology to improve people s lives Work in the program can also serve as preparation for advanced study in this field

The program requirement for a minor in technology and social change is a minimum of 16 credit hours At least 6 of the credits must be in T SC courses (including T SC 341) and at least 9 must be in courses numbered 300 or above Because technology and social change is an interdisciplinary study minor programs must include coursework in at least two departments (excluding T SC) and may not include more than 9 credits in any one department Students seeking a minor should develop a specific program of coursework in consultation with a member of the T SC Advisory Committee who is outside their curriculum and also in consultation with their adviser The student s minor program must be approved by the T SC Supervisory Committee

Courses already approved for inclusion in the undergraduate minor are listed below Typically, a minor will consist of the required T SC courses plus courses selected from the list Students may however petition the T SC Supervisory Committee for permission to include courses not on the list

Technology and Social Change All courses

Agricultural Education and Studies 310 311 315 414

Agricultural Systems Technology 191 233 324 362

Agronomy 114 154 364 406 415 473 483

Animal Science 114 214 285

Anthropology 306 309 311 322 323 325 326 327 332 338 339 340 380

Architecture 221 222 271

Chemical Engineering 210

Chemistry 160

Civil Engineering 350 558

Community and Regional Planning 253 270 272 293 315 380 383 434

Computer Engineering 440

Economics 201 205 206 306 380 411

Electrical Engineering 450 451

English 205 495

Family and Consumer Sciences Education and Studies 279 310 415 421

Food Science and Human Nutrition 167 260

Geography 325

History 271/2 284 285 305 323 362 387

Human Development and Family Studies 102 254 349 380 391

Industrial Engineering 304 375

Journalism and Mass Communication 101 474 476

Liberal Arts and Sciences 230

Management 318 370 414

Materials Science and Engineering 170

Meteorology 404

Philosophy 230 335 380 381 442

Physics 106 271 272 302

Political Science 251 340 347 430 431 452 453 481

Sociology 134 310 325 345 411 415 435

Speech Communication 310 311 314 317 318 414 418

Textiles and Clothing 231 275 354 355 362 404

Transportation and Logistics 460 461 462 466 468

Graduate Study

Work is offered for a minor in technology and social change under a cooperative arrangement with the following departments participating in the program Aerospace Engineering and Engineering Mechanics Agricultural Education and Studies, Agricultural and Biosystems Engineering Agronomy, Animal Science Anthropology Architecture Chemical Engineering Chemistry Civil and Construction Engineering Community and Regional Planning Computer Science Economics Electrical Engineering and Computer Engineering English Family and Consumer Sciences Education and Studies Food Science and Human Nutrition Geological and Atmospheric Sciences History Human Development and Family Studies Industrial Education and Technology Industrial and Manufacturing Systems Engineering Journalism and Mass Communication Management Materials Science and Engineering Mechanical Engineering Philosophy Physics Political Science Professional Studies in Education Sociology Speech Communication Textiles and Clothing, and Transportation and Logistics

Students choosing to minor in technology and social change will pursue a degree program in the major department In consultation with their major professor students should identify a member of the T SC Advisory Committee to serve on the committee guiding their program of study This T SC representative should be a member of the graduate faculty and should be from a discipline outside the major field of study The committee guiding the program of study of a student declaring a minor in technology and social change will select a group of courses from the list given below For the master of science or master of education degree this group should be at least 10 credit hours and for the doctor of philosophy degree the minimum requirement is 15 hours Of this requirement 6 hours must be chosen from courses in technology and social change acceptable for graduate credit including either T SC 541 or 542

The group of courses selected by the student's committee to form a minor in technology and social change must be chosen from outside the major area of study They should be designed to broaden the scope of the student's training to include the humanities, the social sciences and technology The program for the declared minor will be approved by the technology and social change supervisory committee

A graduate minor in technology and social change may be selected from the following suggested courses Students may petition for the inclusion of other courses from the cooperating departments

Technology and Social Change 442 541 542 543 574 590F 640 641

Aerospace Engineering 571

Agricultural Education and Studies 520 521 524 538 560 561 604 625

Agricultural Engineering 522 569 572

Agricultural Systems Technology 435 473

Agronomy All courses appearing in graduate catalog are acceptable

Animal Science All courses appearing in graduate catalog are acceptable

Anthropology 500 511 523 525 526 527 538 539 540 580

Architecture 372 558 572 577

Chemical Engineering 381 410 415 443 508 515

Chemistry 331 332

Civil Engineering 350 558

Community and Regional Planning 380 383 434 511 515 520 527 534 561 575

Computer Science 401

Curriculum and Instructional Technology 501 503

Economics 411 520 561

Electrical Engineering 374 450 451 476

English 517 518 534 535

Family and Consumer Sciences Education and Studies 415 507 521

Food Science and Human Nutrition 360 463 565

History 338 458 459 463 481 482 488 489 574 575 592 597 603 605

Human Development and Family Studies 391

Industrial Education and Technology 502 554 615 652 657

Industrial Engineering 502 503

Journalism and Mass Communication 520 574 590E

Management 414 510 570 571

Materials Science and Engineering All courses appearing in graduate catalog are acceptable

Meteorology 406 504

Philosophy 380 381 430 442

Physics 304 311 311T 361 364 365 511 524 528 531

Political Science 443 481 547 549 552

Professional Studies in Education Ad Ed 469 536 537 538 539 595E Hg Ed 568 582 615B H P C Ed 585 586 ResEv 561

Sociology 411 415 420 464 532 533 535 540 549 550 564 642

Speech Communication 414 418

Textiles and Clothing 354 355 404 504 550 562 580

Transportation and Logistics 460 461 462 466 468 560

Courses Primarily for Undergraduate Students

241 World Food Issues Past and Present (Agron 241 U St 241) (2-0) Cr 2 F Salvador Study of today s world food problems in context of the historical development of agriculture in the major cradles of civilization Emphasis on population trends and socioeconomic policies as means to understand the disparity between potential agricultural production and present energy and nutritional deficiencies in key areas of the developing world

341 Technology International Social and Human Problems (U St 341) (3-0) Cr 3 F *Prereq Junior classification* An interdisciplinary study of the international significance of technology and of the societal and human issues attending its development and adoption

442 Philosophy of Technology (Phil 442 U St 442) (3-0) Cr 3 S *Prereq 6 credits of social scien e or 341 and 3 credits in social science* Conditions under which technological innovations contribute to human emancipation relationship of technology and democracy utility and limits of technical rationality and problems of ensuring that benefits of technological advance are communally shared Issues discussed with reference to contemporary developments in microelectronics technology transfer to the Third World etc

***474 (574 DL) Impact of Communication Technology on People and Societies** (Jl MC 474/574 DL) (3-0) Cr 3 F *Prereq 6 credits in social science* Seminar on present and potential effects of increasingly sophisticated modes of mass communication on people institutions and societies

490F Independent Study Technology and Social Change (U St 490F) Cr var F S SS *Prereq 341* Consideration of problems and issues arising from the impact of the transfer of technology on a society

Courses Primarily for Graduate Students, minor only, open to qualified undergraduates

541 Technology and Social Change in Developing Countries (U St 541) (3-0) Cr 3 F *Prereq Senior or graduate classification* An interdisciplinary study of technology and the effects of technological change within economically less developed countries Analysis of the role of science and technology in development agents of technology transfer such as nongovernmental organizations and multinational corporations implications and consequences of technology transfer issues and constraints involved in choosing an appropriate technology

542 World Food Issues (U St 542) (3-0) Cr 3 S *Prereq 541 or graduate classification* An interdisciplinary study of societal human and technological aspects of the world food situation The study examines four issues the present world food situation the challenge of meeting future food requirements constraints to growth and change and professional scientific and technical strategies for development

543 Development Advisory Team (DAT) Training Workshop (Anthr 543 U St 543) (1-0) Cr 1 (S F) F *Prereq Senior or graduate classification* One week workshop conducted week prior to beginning of fall semester Survey of cultural dimension of effective management development planning communications and team building skills necessary for international development consultancies Materials fee Limited enrollment

***574 (474 DL) Impact of Communication Technology on People and Societies** (Jl MC 474) (3 0) Cr 3 F *Prereq 6 credits in social science* Seminar on present and potential effects of increasingly sophisticated modes of mass communication on people institutions and societies

590F Special Topics Technology and Social Change (U St 590F) Cr var F S SS *Prereq 541* Individual study on topics involving technology and social change in foreign cultures

Courses for Graduate Students, minor only

640 Seminar in Technology and Social Change (U St 640) Cr 1 to 3 each time elected F SS *Prereq 541* Consideration of problems and issues arising from the effects of technological change in foreign cultures Issues and problems vary each time offered

641 Implementing International Agricultural and Rural Development Projects Problems and Issues (Anthr 641 U St 641) (2-0) Cr 2 F *Prereq 543* Cross cultural and multidisciplinary team approaches to international development project design implementation and evaluation Survey of development policies and procedures of USAID and other donor agencies

*See page 119 for information on dual listed courses

Textiles and Clothing

Agatha Huepenbecker Head of Department

Professors Farrell-Beck Huepenbecker Littrell Stone

Emeritus Professors Danielson Hollen Warning Winakor

Associate Professors Brackelsberg Damhorst Kundel

Assistant Professors Fiore Gaskill Kadolph Kunz Schoenberger Shibles

Instructor Glock

Undergraduate Study

The department offers work for the degree bachelor of science with a major in apparel merchandising, design and production The program offers students a broad understanding of textile and apparel products merchandising and marketing strategies *production processes and business practices* leading to a wide range of careers at the state national and international levels in business industry and government Courses in the department provide the scientific technical and humanistic knowledge about textiles, apparel and other sewn products basic to career preparation Additionally courses provide knowledge applicable to the selection and use of apparel and household textiles by individuals families and institutions The program can also be used as a foundation for graduate study

The major in apparel merchandising design and production provides a broad-based program of study with flexibility in creating a program focus Courses are required in the following groups general education family and consumer sciences core and textiles and clothing core To complete the program a student combines structured clusters of courses to form a program focus A student might develop a focus in merchandising design or production, as indicated by the program title A focus in merchandising prepares students for the planning development and presentation of market-oriented product lines Career opportunities are in product development buying promotion and management in both manufacturing and retailing sectors of the textiles and apparel industry

A focus in apparel design is appropriate for those interested in the aesthetic aspects of textiles and clothing through design product or line development or in promotion A focus in production prepares students for positions related to apparel engineering, plant management quality assurance costing product development and buying piece goods or trim for apparel manufacturing firms

In addition a student might focus on international studies consumer behavior, or other areas For example a textiles science orientation might prepare students for careers in textile processing quality assurance textile testing and materials buying A social science orientation may prepare students for positions in consumer relations personnel and training marketing research international business, museums or extension

The department offers a minor in apparel merchandising design and production The minor can be earned by taking T C 131 or 165 104 or 204 225 231 245 or 275, 6 credits at the 300-400 level, and an additional 2 to 3 credit T C course for a total of 16 to 20 credits Also available is an apparel merchandising, design and production designated area of concentration combined with a major in journalism and mass communication in the College of Liberal Arts and Sciences see department for details

Grade point requirement All students majoring in apparel merchandising design and production are required to earn a C– or better in all TC courses applied toward the degree, including transfer credits

English proficiency Undergraduate English proficiency is certified when the student has received a grade of C– or better in English 104 *and* 105 *Students who receive a* D+ D or D– in English 104 or 105 may take English 204 instead of repeating the lower level course

Graduate Study

The department offers the degrees master of science and doctor of philosophy with a major in textiles and clothing as well as minor work for students with majors in other departments

The field of study is highly interdisciplinary programs of study are tailored to students background and interests

Program emphases for graduate study include consumer behavior toward textiles and apparel craft marketing small business management merchandising and marketing aspects of textiles and clothing acquisition and use of textiles and apparel within cultures, U S costume and textiles of the 19th and early 20th centuries textiles social/psychological aspects of dress aesthetics product quality and development and computer-aided design

The department participates in the interdepartmental minor programs of gerontology housing and technology and social change

Open to graduate students for minor credit only 354 355 462 466 468 475

Courses Primarily for Undergraduate Students

***104 Textile Fundamentals** (3-0) Cr 3 F S *Alt SS offered 1995 For non majors Introduction* to textile fiber yarn and fabric characteristics Basic textile terminology serviceability fabrication coloration and finishing selection and performance of textiles for apparel interior and industry uses

121 Apparel Construction Processes (1-4) Cr 3 F S Principles of garment assembly Use of commercial patterns for woven and knit fabrics lockstitch and overlock machines comparison of assembly techniques used in custom-made garments and ready to-wear Materials fee

131 Introduction to Apparel Product Development (2-0) Cr 2 F S Concepts related to and issues in the development of apparel products for consumers

165 Social Aspects of Appearance (3-0) Cr 3 F S Social science approaches to understanding clothing and appearance in contemporary U S society Future trends affecting consumer behavior

***204 Textile Science** (3 3) Cr 4 F S Textile fibers yarns fabrication coloration and finishes Quality and performance evaluation of apparel furnishing and industrial textiles

221 Comparative Apparel Construction Processes (1-4) Cr 3 F *Prereq 121 104 or 204* Decision making process related to selection of garment assembly techniques Use of industrial machines Materials fee

225 Flat Pattern (1 5) Cr 4 F S *Prereq 121 131* Flat pattern designing and related garment construction for men women and children Introduction to pattern drafting grading knock-offs and pattern making by computer Materials fee

231 Apparel Manufacturing (2-2) Cr 3 F S *Prereq 104 or 204 131* Analysis of apparel manufacturing processes with focus on quality performance and cost product development sourcing and development of specifications Field trip fee

245 Apparel Analysis and Selection (2 2) Cr 3 F S *Prereq 131 Art 101 or 108* Visual analysis of the clothed body form as a basis for selection *Consideration of individual physical and social needs* for apparel Overview of fashion process from a design perspective Basics of computer-aided design applied to development of apparel Introduction to portfolio development

275 Textile and Apparel Industries (3-0) Cr 3 F S History and organization of the textiles and apparel industry focus on merchandising and apparel marketing activities at both wholesale and retail international business and trade issues

278 Fashion Illustration (0-6) Cr 3 F S *Prereq Art 130* Drawing the fashion figure and apparel from live models Mixed color media Studies and compositions appropriate to advertising and fashion presentation Survey of historical and contemporary fashion artists Materials fee

***305 (505 DL) Textile Quality Assurance** (2-2) Cr 3 F S *Prereq 104 or 204 231 Chem 160 or 163 163L or one course in physics Stat 101 227 or 401* Principles of textile testing and quality analysis Standardized measurement and evaluation of quality physical characteristics and performance of textile products Developing specifications

325 Draping (1-5) Cr 3 S *Prereq 204 225 245 278 recommended* Pattern making by draping on a standard body form integrating pattern making techniques emphasis on design fit and construction Materials fee

331 Apparel Engineering and Management (2-3) Cr 3 S *Prereq 231 Com S 103 T C 225 recommended* Procedures and experiences related to method analysis time and motion studies costing and production planning resource utilization and quality assurance Field trip fee

342 Aesthetics in the Family (3-0) Cr 3 F S Influence of individual differences and cultural patterns on aesthetic preferences Design principles aesthetic concepts and philosophies applied to everyday living

345 Fashion Design (1-5) Cr 3 F *Prereq 245 278 recommended* Creative problems integrating sources of inspiration procedures and presentation techniques used in designing apparel Analysis of contemporary designers and trends Application of computer-aided design to the design process and presentation Expansion of portfolio development

354 History of Costume I (3-0) Cr 3 S *Prereq 3 credits chosen from Hist or Art H* Clothing and adornment for men women and children in western civilization from prehistoric times to present social economic technological and cultural context for the succession of styles

355 History of Textiles I (3-0) Cr 3 F *Prereq 104 or 204 3 credits chosen from Hist or Art H* Textile processes of selected periods and countries textiles used for costumes and interiors placed in their societal context

362 Cultural Perspectives on Dress (2-0) Cr 2 S *Prereq Anthr 201 or 306 recommended* Analysis of multiple factors related to dress in selected societies including technology aesthetics social organization ritual stability and change

375 Merchandising (3-0) Cr 3 F S *Prereq Com S 103 Math 104 140 150 or 165 junior classification* Principles of merchandising as applied in manufacturing and retailing business organizations Study of planning development and presentation primarily of textile and apparel product lines Computer applications in merchandising

376 Merchandise Planning and Control (3 0) Cr 3 F S *Prereq 375 or Mkt 446* Theories and procedures in planning purchasing and controlling inventories for the profitable management and operation of textile or apparel product lines Computer applications in strategic retail management

377 Visual Merchandising (2-2) Cr 3 S *Prereq 245 375 or Mkt 340* Theories and procedures in planning and executing merchandise presentation and promotion at wholesale and retail levels as related to image sales profit and aesthetics

380 Field Study Cr 2 F S *Prereq 9 credits in textiles and clothing junior classification Permission by application* Study of and tours to textile mills apparel manufacturers designers markets retailers museums testing laboratories and other areas of interest within the textile and apparel industry Field trip fee

*****404 (504 DL) Advanced Textile Science** (3-0) Cr 3 F S *Prereq 104 or 204 Chem 160 or 163 163L* Theories and principles of textile science examination of research including new developments in fiber yarn and fabric formation dyeing and finishing

410 Senior Synthesis in Textiles and Apparel (2 2) Cr 3 S *Prereq Senior classification 165 204 231 245 275* Team approach to creative problem solving and development of consumer products and services application and evaluation of facts and concepts

411 Seminar on Current Issues Cr 1 to 2 each time taken *Prereq Senior classification 12 credits in textiles and clothing* Trends and issues in textiles and clothing

423 Altering and Fitting Apparel (0-3) Cr 1 F *Prereq 225 325* Basic principles of pattern alterations Analysis of fit of custom made garments and ready-to-wear Materials fee

424 Experimental Fashion Design (1 2) Cr 2 F *Prereq 225 245 or 278 325 recommended* Creation of collections of innovative garments and accessories with unusual materials and techniques

462 Global Issues in Textiles and Apparel (3 0) Cr 3 F *Prereq 275 Econ 205 206* Evaluation of key issues facing textiles and apparel businesses in the global economy considering economic political social and professional implications

466 Consumer Behavior and Apparel (2 2) Cr 3 F *Prereq Econ 206 Stat 101 or 227 3 credits in marketing psychology or sociology T C 165 recommended* Application of concepts and theories from the social sciences to the study of consumer behavior toward apparel and adornment Examination of levels and standards of consumption Experience in conducting research

468 Clothing for Special Needs (2-0) Cr 2 S *Prereq 165 or HD FS 353 or 360* Analysis of functional clothing needs across the life span Emphasis on children elderly and those whose abilities or situations create special needs

470 Supervised Experience Cr 2 to 6 F S SS *Prereq Minimum 2 0 GPA permission by application junior or senior classification* Supervised work experience in a cooperating retail firm textile or apparel manufacturing firm design studio museum or an extension program

A Textile Industry Prereq 305
B Historic Textiles and Clothing Prereq 5-6 credits from 354 355 362 3 credits in anthropology recommended
C Apparel Design Prereq 278 9 credits in pattern making and construction
I Merchandising Cr 4 or 6 Prereq 375
J Extension Prereq 6 credits in textiles and clothing
N Apparel Production Management Prereq 331

****475 Merchandising Management** (3-0) Cr 3 F *Prereq 275 or Mkt 340 or Mkt 446* Analysis of behavioral management theories and principles as applied to merchandising environments human relations in management

490 Independent Study Cr arr F S *Prereq 6 credits in textiles and clothing permission of the instructor adviser and department executive officer*

A Textile Science
B History of Textiles
C Apparel Design and Construction
D Fashion Design
E History of Costume
F Sociological and Psychological Aspects of Clothing and Textiles
G Economic Aspects of Clothing and Textiles
H Honors
I Merchandising
K Cultural
N Apparel Production Management

499 Undergraduate Research Cr 1 to 3 each time taken F S *Prereq Senior classification 15 credits in textiles and clothing permission of instructor adviser and department executive officer* Research experience in textiles and clothing with application to a selected problem

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*Credit for both 104 and 204 may not be applied toward graduation

**Credit for both 475 and Mgmt 371 may not be applied toward graduation

***See page 119 for information on dual listed courses

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

*****504 (404 DL) Advanced Textile Science** (3 0) Cr 3 Alt F offered 1994 *Prereq 104 or 204 Chem 160 or 163 163L* Theories and principles of textile science examination of research including new developments in fiber yarn and fabric formation dyeing and finishing

*****505 (305 DL) Textile Quality Assurance** (2-2) Cr 3 Alt F offered 1993 *Prereq 104 or 204 231 Stat 101 227 or 401 Chem 160 or 163 163L or one course in physics* Principles of textile testing and quality analysis Standardized measurement and evaluation of quality physical characteristics and performance of textile products Developing specifications

510 Survey of Research in Textiles and Clothing (1-0) Cr 1 F *Prereq Graduate classification* Overview of research in textiles and clothing with emphasis on classic research and current and future directions of the field

511 Research Methods (FCEdS 511) (3-0) Cr 3 F *Prereq Graduate classification* An overview of research approaches focusing on testing and generating theory Methods for collecting and analyzing quantitative and qualitative data Development of research proposals

550 History of Costume and Textiles II (3-0) Cr 3 Alt S offered 1994 *Prereq 204 354 or 355* Techniques of historic research applied to clothing and textiles relationship of artifacts to documentary sources of information individual topics

557 Conservation of Textiles and Apparel (3 0) Cr 3 Alt S offered 1995 *Prereq 104 or 204 354 or 355* Purpose and function of historic textiles and apparel collections problems in acquisition and cataloging techniques for maintenance storage and exhibition of historic textile products Field trip fee

562 Dress and Culture (3-0) Cr 3 Alt F offered 1994 *Prereq 165 6 credits in social science or 6 credits in cultural anthropology* Analysis of dress as artifact behavior and symbol in selected cultures

564 Clothing Consumption (3-0) Cr 3 Alt F offered 1993 *Prereq Econ 206 Stat 101 or 227* Theories of clothing consumption factors affecting family expenditures and levels and standards of consumption for clothing and household textiles

570 Practicum in Textiles and Clothing Cr 1 to 3 F S SS *Prereq 7 textiles and clothing graduate credits permission of department executive officer and instructor* Supervised experience related to career objective Proposal must be approved semester before placement

580 International Study Cr var Alt S offered 1994 *Prereq 9 credits in textiles and clothing permission by application* Study abroad of apparel and textile design merchandising production distribution and consumption textiles in museums Countries vary Field trip fee May be repeated

590 Special Topics *Prereq Permission of department executive officer and instructor(s) concerned* Cr arr

A Textile Science
B History of Textiles
C Apparel Design and Construction
D Fashion Design
E History of Costume
F Sociological and Psychological Aspects of Clothing and Textiles
G Economic Aspects of Clothing and Textiles
I Merchandising
K Cultural Aspects of Dress
L Conservation
N Product Development
P Interdisciplinary

593 Workshop Cr arr SS

Courses for Graduate Students, major or minor

610 Analysis of Research in Textiles and Clothing Cr 1 Alt S offered 1995 *Prereq 6 graduate credits in textiles and clothing research methods* Models theory methods and philosophy and ethics of science as applied in textiles and clothing research Research publications and priority setting in the field

611 Seminar Cr 1 to 3 each time taken *Prereq 6 graduate credits in textiles and clothing permission of instructor* Discussion of research and current issues Topics vary

665 Social, Psychological and Aesthetic Analysis of Appearance (3-0) Cr 3 Alt S offered 1994 *Prereq 466 and 3 credits in design or 6 credits in upper level sociology or psychology* Analysis of social science theories and concepts applicable to clothing and appearance research Analysis of the clothed body using theories from sensory perception and philosophy of art

667 Research in Consumer Behavior Toward Textiles and Apparel (2 2) Cr 3 Alt S offered 1995 *Prereq 9 credits in textiles and clothing or 6 credits upper level social science or marketing* Analysis of research related to consumer behavior toward dress and textile products Design and execution of research study

690 Advanced Topics Cr arr *Prereq Enrollment in doctoral program and permission of instructor*

699 Research

Theatre

(Administered by the Department of Music)

Professor in Charge

Associate Professors Gouran Hirvela

Assistant Professors Cox Kohlhepp Szabo Wicks

Undergraduate Study

Students interested in a theatre major need to propose an interdisciplinary studies major leading to a bachelor of arts degree that combines study in theatre with work in a related area e g music literature psychology, sociology art and design or dance The following courses are recommended as part of the interdisciplinary studies major in theatre Theatre 250 251 255 351 357 360 363 365 455 465 and 466 Guidelines are available from the department

The theatre area offers a wide variety of courses Students may select from a core of courses in acting design (costume scenic lighting/sound) make-up stage direction theatre management and theatre history Independent study and special topics courses supplement formal course offerings to provide opportunities to intensify study in a particular aspect of theatre

Students implement the theories and principles explored in the classroom Iowa State University Theatre presents mainstage productions and studio productions in Fisher Theater Auditions for ISU Theatre productions are open to all students irrespective of academic major Similarly participation in areas of production other than acting is open to both majors and nonmajors Qualified students also present experimental and laboratory productions

The Minority Theatre Workshop is an essential component of ISU Theatre

Senior and honor scholarships are awarded on a regular basis to students who make significant contributions to Iowa State University Theatre

Graduate Study

The department offers graduate courses as supporting work in other fields

Open to graduate students for minor credit only 465, 466

Course Primarily for Undergraduate Students

106 Introduction to the Performing Arts (3-0) Cr 3 F S SS An audience oriented broad based team taught survey of the performing arts which emphasizes theatre and includes segments on television radio film dance and music

151 The Actor's Voice (3-0) Cr 3 F Study of fundamentals of vocal production breathing quality articulation projection and expressiveness for the performing artist

224 Concert and Theatre Dance (Dance 224) See *Physical Education Dance*

250 Theatre Practice Cr 1 or 2 each time taken maximum of 6 credits F S *Prereq Permission of instructor* Practice in various aspects of technical theatre production Offered on a satisfactory-fail basis only

251 Beginning Acting (3-0) Cr 3 F S Theory and practice in fundamentals of acting

252 African American Theatre Production Styles (Af Am 252) (3-0) Cr 3 F S An exploration of the African American theatre process Acting styles

255 Fundamentals of Modern Theatre Practice (3 3) Cr 4 F S Standard structure and procedures for theatrical production including play analysis methods of communication fundamentals of directing design (scenic costume and lighting) and stagecraft lab required

290 Special Projects Cr 1 to 3 each time taken maximum of 6 credits F S SS *Prereq 3 credits in theatre permission of instructor approval of written proposal*

316 Creative Writing—Playwriting (Engl 316) (3-0) Cr 3 S *Prereq Engl 105 not open to freshmen* Progresses from production of scenes to fully developed one-act plays Emphasis on action staging writing analytical reading workshop criticism and individual conferences

351 Intermediate Acting (3 0) Cr 3 S *Prereq 251 Dance 120 recommended* Theory and practice of advanced techniques of acting with emphasis on character and scene analysis

357 Stage Make-up (2-2) Cr 3 F Theories and techniques of stage make up and theatrical hair styling Laboratory in practical application

358 Oral Interpretation (3-0) Cr 3 F Principles of oral interpretation practice in analysis in reading aloud of literary selections and in reader s theatre

359 Theatre for Youth (3-0) Cr 3 S Study of directing acting organizing and producing for theatre for youth

360 Stagecraft (3-2) Cr 4 S **Prereq 255** Tools materials and techniques in constructing and painting scenery including metalwork Technical drawing for the construction of scenery Laboratory in practical application

362 Creative Dramatics (3 0) Cr 3 F S *Prereq Junior classification* Storytelling improvisation and playmaking with children and adults

363 Analysis and Criticism of Dramatic Production (3 0) Cr 3 F S Theory and analysis of scripts for production

365 Theatrical Design I (3 2) Cr 4 F *Prereq 255* An exploration of the art inherent in all areas of theatrical design Emphasizes the collaborative nature of theatre Laboratory required

366 Theatrical Design II (3 2) Cr 4 S *Prereq 365* A continuation of 365 The application of principles to theatrical design Emphasizes the collaborative nature of theatre Laboratory required

367 Stage Management (3 0) Cr 3 F *Prereq 255* The responsibilities and techniques of stage management for the theatrical stage

393 Workshop Cr var 1 to 3 each time offered F S SS *Prereq 3 credits in theatre approved written proposal* Offered irregularly to explore special topics not adequately covered in other course offerings

452 Arts Management (3-0) Cr 3 S *Prereq 6 credits in the visual or performing arts* Principles of management finance public relations and publicity as they apply to problems and practice in the performing arts

455 Directing I (3 0) Cr 3 F *Prereq 255 251 recommended* Theory techniques and practice of directing

461 Advanced Design (3 2) Cr 4 each time taken maximum of 12 F S *Prereq 365* Focuses on the art and craft of specific areas of theatrical design Each semester will focus on one of the four following topics graphic communication scene design costume design or lighting design Laboratory required

465 History of Theatre I (3-0) Cr 3 F *Prereq Hist 201 or equivalent* Theatrical art from ancient times to 1800

466 History of Theatre II (3-0) Cr 3 S *Prereq 465* Theatrical art from 1800 to present

469 Theatre Practicum Cr 1 to 3 each time taken maximum of 3 credits per semester maximum of 6 credits total F S SS *Prereq 9 credits in theatre courses junior classification* Practicum in production with ISU Theatre with opportunities for specialization within various areas Required Approval of written proposal

490 Independent Study Cr 1 to 3 each time taken F S SS Only one independent study enrollment within the department is permitted per semester no more than 9 credits in Thtre 490 may be counted toward graduation *Prereq 9 credits in theatre approved written proposal junior classification*

498 Senior Seminar (3 0) Cr 3 S *Prereq 15 credits in theatre courses senior classification* Directed study of a theatre issue or problem identified by each student Students synthesize relevant theory and research culminating in senior project or paper

499 Theatre Internship Cr var 1 to 8 each time taken maximum of 8 F S SS *Prereq 18 credits in theatre other courses deemed appropriate by faculty adviser 2nd semester junior or senior standing cumulative GPA of at least 2 5 overall and 3 0 in theatre courses* Supervised application of theatre in professional settings

Courses Primarily for Graduate Students, open to qualified undergraduates

504 Seminar Cr 1 to 3 each time taken F S SS *Prereq 9 credits in theatre* Topics may include the following

A Musical Theatre
B Acting Techniques
C Acting Styles
D Design and Technical Theatre

551 Advanced Acting (3-0) Cr 3 F *Prereq 351 and permission of instructor* Analysis and practice of period scenes

555 Directing II (2-2) Cr 3 S *Prereq 455* Practical and theoretical experience in directing the stage play

590 Special Topics Cr 1 to 4 each time taken maximum of 12 credits *Prereq Approved written proposal*

Toxicology

(Interdepartmental Graduate Major)

Supervisory Committee J R Coats Chair G J Atchison T L Carson, D L Hopper G A Kraus G D Osweiler

Work is offered for the degrees master of science and doctor of philosophy with major in toxicology in various cooperating departments Animal Ecology Animal Science Biochemistry and Biophysics, Botany Chemistry Entomology Food Science and Human Nutrition Microbiology Immunology and Preventive Medicine Plant Pathology Veterinary Anatomy Veterinary Pathology Veterinary Physiology and Pharmacology and Zoology and Genetics

The prerequisites for entrance into the graduate toxicology major include an undergraduate degree in a relevant area of study for example chemical engineering biology biochemistry, chemistry ecology entomology food science and technology microbiology nutritional science, zoology or veterinary medicine Minimum undergraduate

coursework should include the following or their equivalent 1 year of college mathematics including calculus 1 year of inorganic chemistry with quantitative analysis 1 course in physics 1 year of organic chemistry, 2 years of biological sciences including 1 course in physiology

Other courses that are considered desirable in the undergraduate preparation include biochemistry physical chemistry qualitative analysis, and some specialized courses such as histology or advanced physiology Prospective students not meeting these requirements may be admitted on a provisional basis with approval of the admissions committee and the program of study committee

Facilities and faculty are available in these departments for fundamental research in such areas as aquatic toxicology, environmental fate and effects of chemicals food safety neurotoxicology nutritional toxicology pesticides and veterinary toxicology

Students majoring in toxicology will be affiliated with a department and choose a major professor from the participating faculty in that department All Ph D students take a core curriculum consisting of Tox 501 and 502 2 credits of Tox 500 (Toxicology Seminar) 7 additional credits in toxicology, 8 credits in biochemistry (from B B 404 405 420 451 521) 3 graduate credits in physiology histology or pathology Stat 401 and 402 M S students take a core of Toxicology 501 and 502 1 credit of Toxicology 500 Seminar 3 additional credits in toxicology B B 404 and 405 Stat 401 Additional coursework is selected to meet departmental requirements and to satisfy individual student research interests toxicology courses may be chosen from those listed below The foreign language requirement is determined by the student s major department

A graduate minor in toxicology is available for students enrolled in other majors A minor for an M S degree includes Tox 500 and 501 and 6 credits in other toxicology courses A minor at the Ph D level includes Tox 500 501 and 9 credits in other toxicology course work One member of the student s program of study committee will be a member of the toxicology faculty

Courses for Undergraduate Students, minor only

419 Foodborne Hazards (FS HN 419) See *Food Science and Human Nutrition*

420 Food Microbiology (MIPM 420) See *Microbiology Immunology and Preventive Medicine*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Toxicology Seminar (V Pth 500) (1-0) Cr 1 F S *Prereq Permission of instructor* Presentation of current topics in toxicology by graduate students faculty and guest lecturers from off campus

501 Principles of Toxicology (V Pth 501 Zool 501) (3-0) Cr 3 S *Prereq Biochemistry 404 or equivalent* Principles of toxicology governing entry fate and effects of toxicants on living systems Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification Fundamentals of foreign compound effects on metabolism physiology and morphology of different cell types tissues and organ systems

502 Toxicology Methods (V Pth 502 Zool 502) 90(0-6) Cr 3 Alt F offered 1993 *Prereq 501* Provides demonstrations or laboratory experience in the application of methods used in toxicology including safety procedures calculation and data analysis teratologic and morphologic evaluation electrophysiologic measures in vitro enzyme induction/biotransformation neural and behavioral toxicology testing

513 Pollution Ecology (A Ecl 513) See *Animal Ecology*

524 Veterinary Medical Mycology (MIPM 524) See *Veterinary Microbiology*

519 Food Toxicology (FS HN 519) See *Food Science and Human Nutrition*

526 Veterinary Toxicology (V Pth 526) (3-0) Cr 3 S *Prereq V Pth 542* Disease processes in animals caused by toxicants use of differential diagnostic and therapeutic procedures

535 Biological Statistics (Stat 535) See *Statistics*

544 Aquatic Toxicology and Hazard Evaluation (A Ecl 544) See *Animal Ecology*

546 Clinical and Diagnostic Toxicology (V Path 546) (0-3 to 0 9) Cr 1 to 3 *Prereq V Pth 526 or DVM degree* Advanced study of current problems and issues in toxicology Emphasis on problem solving utilizing clinical epidemiological and laboratory resources

550 Pesticides in the Environment (Ent 550) See *Entomology*

555 Neurobehavioral Toxicology (V Pth 555) (3 0) Cr 3 Alt F offered 1993 *Prereq V Pth 501* Advanced study of neurotoxicology and behavior Emphasis on methods in neurobehavioral toxicology and the effects of a broad spectrum of neurotoxic agents See *Veterinary Pathology*

560 General Pharmacology (VPP 560) See *Veterinary Physiology and Pharmacology*

590 Special Topics

Courses for Graduate Students, major or minor

626 Advanced Food Microbiology (FS HN 626) See *Food Science and Human Nutrition*

641 Organic Pesticide Toxicology (V Pth 641) (2-0) Cr 2 Alt F offered 1993 *Prereq Courses in biochemistry and physiology* Organic pesticides as related to biologic effects in animals of economic importance public health hazards and environmental effects

643 Natural Toxins (V Pth 643) (1 6) Cr 3 Alt F offered 1994 *Prereq Courses in biochemistry and physiology* Naturally occurring toxins in foods and feeds poisonous plants and venoms

645 Agricultural and Environmental Analytical Toxicology (V Pth 645) (1-3) Cr 2 F *Prereq Chem 211 322* Analysis and interpretation of toxicant residues in animal tissues foods water soil and other environmenbtal specimens

675 Insecticide Toxicology (Ent 675) (2 3) Cr 3 Alt F offered 1993 *Prereq Ent 655* Coats Principles of insecticide toxicology classification mode of action metabolism and environmental effects of insecticides

699 Research

Transportation and Logistics

James C McElroy Chair of Department

Professors Allen Poist, Shrock

Emeritus Professors Thompson Voorhees

Associate Professors Crum Walter

Assistant Professor Holcomb

Instructor Blanshan

Undergraduate Study

For undergraduate curriculum in business, major in transportation and logistics leading to the degree bachelor of science see *College of Business Curricula*

Transportation and logistics management is a discipline concerned with the efficient flow of materials through our industrial and economic system Transportation management deals with the management of the domestic and international modes of transportation in today's rapidly changing economic environment Logistics management assumes the systems approach to the management of a wide variety of activities such as inventory control warehousing traffic management location analysis packaging materials handling and customer service

The study of transportation and logistics serves as a specialized program for those who plan careers in transportation or logistics with shippers, carriers and government agencies It is a broad-based educational program which emphasizes the managerial aspects of transportation and logistics systems and concepts

The requirements for the transportation and logistics major are met by completion of the following courses TrLog 460 461, 462 469 plus a choice of one of the following TrLog 364 463 466 or 468 In addition one non-TrLog course will be selected from a list of approved courses (Please see College of Business Undergraduate Programs Office for list of approved courses)

Graduate Study

The department participates in two graduate degree programs the M S in business administrative sciences and the M B A full-time day and part-time weekend programs The M S degree in business administrative sciences is a 30-credit curriculum culminating in a thesis The M B A programs are 48-credit nonthesis noncreative component curricula in which the first 24 credits are designed to be completed in lock-step fashion The department also participates in the interdepartmental major in transportation planning

Open to graduate students for minor credit only 461 462 466, 468 and 469

Courses Primarily for Undergraduate Students

360 Business Logistics (3-0) Cr 3 F S SS *Prereq Econ 201 or 206 and junior classification* Introduction and analysis of the logistics concept to include the management of transportation inventory packaging warehousing materials handling order processing facility location and customer service

364 Urban and Rural Transportation Management (3-0) Cr 3 F *Prereq 360* Urban and rural passenger and freight transportation from both a management and a public policy perspective The social and economic impacts of transit systems Issues and problems involved in managing the operation finance and marketing of public and private transit systems

460 Advanced Logistics Management (3-0) Cr 3 F S SS *Prereq 360 and Stat 101 or 227* Development of logistics topics introduced in 360 Emphasis on managing inbound and outbound flows of products and associated information requirements in the logistics system

461 Transport Economics (3 0) Cr 3 F S *Prereq Stat 101 or 227 Econ 201 or 206 junior classification* The role of transportation in the economy The economic characteristics of the various modes of transportation including the nature of transport demand and cost functions economic dimensions of transport service transport market structures and transport pricing theory and practice Emphasis on managerial implications of transport economic principles

462 Transportation Carrier Management (3-0) Cr 3 F S *Prereq 461* Analysis of transport users requirements Carrier management problems involving ownership and mergers routes competition labor and other decision areas

463 Industrial Purchasing (3 0) Cr 3 *Prereq 360* Principles and policies in obtaining goods and services for the firm Emphasis on purchasing as it relates to materials management

466 International Transportation and Logistics (3-0) Cr 3 F S *Prereq 360* Logistics systems and legal framework for the international movement of goods Operational characteristics of providers of exporting and importing services The effects of government trade policies on global logistics

468 Transportation and Public Policy (3 0) Cr 3 F S SS *Prereq 461* Analysis of current policies affecting transportation providers and users The roles of carrier and shipper organizations government agencies and other interest groups in policy development Evaluation of impact of programs policies and legislation on various transportation constituencies

469 Transportation and Logistics Issues (3 0) Cr 3 F S *Prereq 460 credit or enrollment in 462* An integrative capstone course designed to study contemporary problems and issues in transportation and logistics

490 Independent Study Cr 1 3 each time taken *Prereq 360 senior classification permission of instructor*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

560 Business Logistics Strategies (3-0) Cr 3 F *Prereq Econ 201 or 206 and graduate classification* Management of the logistics functions in the firm including transportation inventory control warehousing packaging facility location materials handling and customer service Includes both theoretical aspects and practical applications in logistics

590 Special Topics Cr 1 to 5 each time taken F S SS *Prereq Graduate classification and permission of instructor* For students who wish to do individual research in a particular area of *transportation or logistics*

Transportation Planning

(Interdepartmental Graduate Major)

Supervisory Committee T Maze Chair B J Allen M R Kihl

Work is offered for the degree master of science (thesis option only) with a major in transportation planning under a cooperative arrangement with various departments including Civil and Construction Engineering Community and Regional Planning and Transportation and Logistics Opportunities are afforded for research in such areas as modeling and performance of transportation systems techniques for urban and regional transportation system planning environmental and social policy analysis of transportation systems, transportation policy analysis analysis of transportation technologies commodity distribution public administration of the transportation planning process regional development and transportation system interrelationships transportation economics and finance and planning for logistics management

Students majoring in transportation planning will choose a major professor from the graduate faculty membership of the cooperating departments and will develop a program of study under the guidance of a committee nominated by the administrative department head approved by the departmental transportation planning supervisory committee representative and appointed by the dean of the Graduate College For administrative purposes students will be in the departments of their major professors

A student must complete at least 30 credit hours of acceptable work including preparation of a thesis A structured minor requires 12 credits of approved transportation planning courses and a thesis or creative component on a transportation planning related topic

A required core includes CE 451 Tr Pl 691 and at least one course from two different cooperating departmental offerings included among the following courses C E 558 C R P 522, TrLog 560 Detailed requirements are available from the chair of the supervisory committee

Graduate students pursuing a major in any of the cooperating departments who have an interest in transportation planning are encouraged to consider a formal declared minor in transportation planning Students considering a declared minor should consult with the chair of the supervisory committee about the requirements for it

Courses Primarily for Graduate Students, major only

691 Seminar in Transportation Planning (1 0) Cr 1 each time taken F S Offered on satisfactory fail basis only

699 Research

University Studies

John J Kozak Provost

Certain interdisciplinary courses are offered through university studies at the discretion of the provost and the Faculty Senate Curriculum Committee No major is available in university studies but credit obtained through university studies offerings may be applied toward a degree in any of the colleges consistent with the stipulations of the student's curriculum

Requests to make use of U St 101 290 301 and 490 should be directed to the provost and should be accompanied by a positive recommendation from the department heads and deans of the instructors making the request The Faculty Senate Curriculum Committee will consider all requests and recommend to the provost regarding their *disposition after consultation with relevant* college and university committees

The Graduate College sponsors U St 170 180 and 511 to help graduate students carry out instructional tasks as teaching assistants Placement in 170 and 180 is determined by examination (SPEAK/TEACH tests) In addition tutoring can be arranged on an individual basis for international teaching assistants seeking specific help with pronunciation and/or guidance in spoken English

Open to graduate students for minor credit only 415 421 425

Courses Primarily for Undergraduate Students

101 Interdisciplinary Studies Cr var Yr Offered when demand warrants Experimental interdisciplinary courses offered by an interdepartmental group Intended primarily for freshman and sophomore offerings

110 London Program (IntSt 110) See *International Studies*

120 International Studies (IntSt 120) See *International Studies*

121H Freshman Honors Seminar (0-2) Cr 1 F *Prereq Membership in the Freshman Honors Program* Orientation to Iowa State University and to the University Honors Program Offered on a satisfactory fail basis only Fee

170 Speech Improvement for Nonnative Speakers (CmDis 170) (0 2) Cr 1 or (1-2) Cr 2 F S *For nonnative speakers of English only* Development of effective English vowel and consonant productions intelligibility in conversational English and appropriate stress patterns

180 Communication Skills for International Teaching Assistants (Engl 180) (1 to 3-0) Cr 1 to 3 F S Several sections are offered with assignment based on international teaching assistants communication needs (fluency presentation skills vocabulary etc) Offered on a satisfactory fail basis only Credit for U St 180 may not be applied toward graduation Not available for credit to anyone whose native language is English

210 London Program (IntSt 210) See *International Studies*

220 International Studies (IntSt 220) See *International Studies*

223 Environmental Science (Env S 223) See *Environmental Studies*

225 Environmental Education (Env S 225) See *Environmental Studies*

235 Introduction to International Studies (IntSt 235) (3 0) Cr 3 F Overview of international studies emphasizing cultural economic and political characteristics of major groups of nations and their interactions

241 World Food Issues Past and Present (Agron 241 T SC 241) See *Agronomy*

290 Special Problems Cr var *Prereq Permission of the provost* Independent study on topics of an interdisciplinary nature Intended primarily for freshmen and sophomores
E Environmental Studies (Env S 290E)
H Honors
R Research Interns

298 398 498 Federal Cooperative Education Program Cr R F S SS *Prereq Permission of director ISU Career Planning and Placement Services 298 sophomore classification 398 junior classification 498 senior classification* Required of all Federal Cooperative Education students Students must register for these courses prior to commencing each work period with the Federal Government

301 Interdisciplinary Studies Cr var Yr Offered when demand warrants Experimental interdisciplinary courses offered by an interdepartmental group Intended primarily for junior and senior offerings

302H Honors Leadership Seminar (1 2) Cr 2 F *Prereq Selection as a leader of a Freshman Honors Seminar* For students serving as leaders of Freshman Honors Seminars under faculty supervision Development of teaching and leadership skills within the context of an Honors education experience Offered on a satisfactory fail basis only

310 London Program (IntSt 310) See *International Studies*

320 International Studies (IntSt 320) See *International Studies*

321 322 University Honors Seminars (2 0) Cr 1 or 2 F S SS *Prereq Membership in the University Honors Program* Interdisciplinary seminars on topics to be announced in advance Offered on a satisfactory fail basis only

324 Energy and Air Pollution (Env S 324) See *Environmental Studies*

341 Technology International Social, and Human Problems (T SC 341) See *Technology and Social Change*

390 Internship in Environmental Studies (Env S 390) See *Environmental Studies*

410 London Program (IntSt 410) See *International Studies*

415 Environmental Studies Seminar (Env S 415) See *Environmental Studies*

420 International Studies (IntSt 420) See *International Studies*

421 Field Seminar (Env S 421) See *Environmental Studies*

425 Environmental Issues (Env S 425) See *Environmental Studies*

430 Seminar in International Studies (IntSt 430) (3-0) Cr 3 S Capstone seminar in international studies focused on cultural economic political social and other issues in a global perspective

466 Gerontology Prepracticum Seminar (Geron 466) See *Gerontology*

467 Gerontology Practicum (Geron 467) See *Gerontology*

490 Independent Study Cr var *Prereq Permission of the provost* Independent study on topics of an interdisciplinary nature Intended primarily for juniors and seniors
E Environmental Studies (Env S 490E)
F Technology and Social Change (T SC 490F)
H Honors
I International Studies

Courses Primarily for Graduate Students, open to qualified undergraduates

511 Teaching Assistants Orientation Seminar (TAOS) (Curr 511) (0-2) Cr 1 F S *Prereq Graduate classification* Survey of basic techniques of college teaching for graduate teaching assistants who have no background in teaching Videotaped microteaching experiences methods of lecturing conducting discussion questioning and reinforcement simple media production and classroom testing and evaluation

541 Technology and Social Change in Developing Countries (T SC 541) See *Technology and Social Change*

542 World Food Issues (T SC 542) See *Technology and Social Change*

543 Development Advisory Team Training Workshop (T SC 543) See *Technology and Social Change*

590 Special Topics Independent study on topics of an interdisciplinary nature Intended primarily for graduate students
F Technology and Social Change (T SC 590F)

Courses for Graduate Students, minor only

640 Seminar in Technology and Social Change (T SC 640) See *Technology and Social Change*

641 Implementing International Agriculture Projects (T SC 641) See *Technology and Social Change*

Veterinary Anatomy

Mary Helen Greer Chair of Department

Professors Adams Bal Dellmann Draper Ghoshal Keller Uemura

Emeritus Professors J Carithers Christensen

Associate Professor Greer Jacobson Jeftinija Spencer

Assistant Professor Ackermann

Undergraduate Study

For the undergraduate curriculum leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

Through courses in this department students acquire a detailed knowledge of the anatomy of domestic animals which is necessary for a proper understanding of physiology pharmacology pathology diagnosis surgery and medicine

Graduate Study

The department offers work leading toward the degrees master of science and doctor of philosophy with a major in veterinary anatomy and minor work for students majoring in other departments Both thesis and nonthesis options are available for the master of science degree Up to 10 credits of dual-listed veterinary anatomy courses may be applied for major graduate credit

Areas of concentration include development and aging of the nervous system hypothalamic development and differentiation *in vitro* hypothalamic regeneration role of hypothalamus in stress induced suppression of the immune system neuroendocrinology neural hormonal and neuropeptide control of food intake transmission of sensory information at spinal cord synapses upper respiratory system quantitative morphology and comparative morphology

The department also participates in the interdepartmental majors in MCDB (molecular cellular and developmental biology) and toxicology and in the interdepartmental program in neuroscience

An educational background substantially equivalent to an undergraduate curriculum in one of the life sciences at Iowa State University provides appropriate preparation for advanced study in veterinary anatomy

Foreign language requirements may be established by the student s program of study committee

Open to graduate students for minor credit only 421

Courses Primarily for Undergraduate Students

***305 (505 DL) Principles of Morphology** (2 9) Cr 5 F *Prereq First year classification in veterinary medicine* Basic anatomy of mammals concentrating on domestic species

***306 (506 DL) Microscopic Anatomy** (3-3) Cr 4 F *Prereq First year classification in veterinary medicine* Cytology histology and organology of domestic animals

***307 (507 DL) Neuroanatomy** (2 6) Cr 2 S 8 weeks *Prereq First year classification in veterinary medicine* Neuroanatomy of domestic animals

***321 (521DL) Anatomy of Companion Animals** (1 6) Cr 3 S *Prereq 305* Special and applied anatomy of companion animals emphasizing the dog and cat

***322 (522 DL) Anatomy of Food and Fiber Producing Animals** (1-6) Cr 3 S *Prereq 305* Special and applied anatomy of domestic ruminants and pig

403 Behavior of Domestic Animals (1-0) Cr 1 Alt S offered 1994 *Prereq Classification in veterinary medicine* Normal and abnormal behavior patterns observed in domestic animals and behavior modification procedures

***415 (515 DL) Anatomy of Laboratory Animals** (1 2) Cr 2 Alt S offered 1994 *Prereq One year of college biology* Gross anatomy and histology of laboratory animals

***416 (516 DL) Avian Anatomy** (1-2) Cr 2 Alt S offered 1995 *Prereq One year college biology* Gross and microscopic anatomy of domestic and exotic birds

421 Special and Applied Anatomy of the Horse (1 3) Cr 2 F *Prereq 305 classification in veterinary medicine or An S 413* Applied anatomy of the horse

490 Independent Study Cr arr *Prereq Permission of instructor*
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***505 (305 DL) Principles of Morphology** (2 9) Cr 5 F *Prereq 10 credits in biological science and permission of instructor* Basic anatomy of mammals concentrating on domestic species

***506 (306 DL) Microscopic Anatomy** (3 3) Cr 4 F *Prereq 10 credits in biological science and permission of instructor* Cytology histology and organology of domestic animals

***507 (307 DL) Neuroanatomy** (2 6) Cr 2 S 8 weeks *Prereq 10 credits in biological science and permission of instructor* Neuroanatomy of domestic animals

509 Systematic Anatomy (2 6) Cr 4 Alt SS offered 1994 *Prereq One year of college biology and permission of instructor* For non-anatomy majors
A Ruminant Anatomy Cr 4
B Nonruminant Anatomy Cr 4

511 Functional Neuroanatomy and Morphology of Neurotransmitter Pathways (MCDB 511) (2-4) Cr 4 Alt F offered 1994 *Prereq 10 credits in biological science and permission of the instructor* Basic organizational schemes of the mammalian brain including cytoarchitecture chemoarchitecture and connectivity of different regions of the nervous system

***515 (415 DL) Anatomy of Laboratory Animals** (1-2) Cr 2 Alt S offered 1994 *Prereq One year of college biology* Gross anatomy and histology of laboratory animals

***516 (416 DL) Avian Anatomy** (1 2) Cr 2 Alt S offered 1995 *Prereq One year college biology* Gross and microscopic anatomy of domestic and exotic birds

***521 (321 DL) Anatomy of Companion Animals** (1-6) Cr 3 S *Prereq 505 and permission of instructor* Special and applied anatomy of companion animals emphasizing the dog and cat

***522 (322 DL) Anatomy of Food and Fiber Producing Animals** (1-6) Cr 3 S *Prereq 505 and permission of instructor* Special and applied anatomy of domestic ruminants and pig

530 Current Topics in Microscopic Anatomy of Tissues and Organs (2-0) Cr 2 each time taken Alt F offered 1993 *Prereq A course in microscopic anatomy* Recent findings based on

light and electron microscopic techniques including immunocytochemistry *in situ* hybridization histochemistry and autoradiography Selected organ systems functional adaptations

590 Special Topics Cr 1 to 6
A Gross Anatomy
B Microscopic Anatomy
C Developmental Anatomy
D Neuroanatomy
E Applied Anatomy

599 Creative Component Cr 1 to 3 Creative component for nonthesis master of science degree

Courses for Graduate Students, major or minor

690 Advanced Topics Cr 1 to 3
A Gross Anatomy
B Microscopic Anatomy
C Developmental Anatomy
D Neuroanatomy

698 Seminar Cr 1

699 Research
A Gross Anatomy
B Microscopic Anatomy
C Developmental Anatomy
D Neuroanatomy

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*See page 119 for information on dual listed courses

Veterinary Clinical Sciences

Lawrence E Evans Chair of Department

Professors Betts Eness Evans Grier Hartwig Hoefle Hopkins Jackson Kunesh Merkley Noxon Pearson D Riedesel Wass

Emeritus Professors Baker R Carithers Clark Emmerson Lundvall

Associate Professors Booth Kersting Reinertson E Riedesel Thompson Uhlenhopp Wagner Ware

Assistant Professors Baldwin Hopper Jergens Miles Nieves O Brien

Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

The study of medicine and surgery expands the training previously received in anatomy physiology pharmacology pathology and microbiology

The department presents coursework in animal reproduction concerning interferences with parturition diseases of the newborn and infertility

The teaching of radiology emphasizes the handling exposing processing and interpreting of radiographs and the dangers of ionizing radiation to humans and animals Alternate imaging modalities including ultrasonography are also taught

Hospital assignments during the fourth year provide the student an opportunity to participate in the application of clinical skills and knowledge

Graduate Study

The department offers work for the degree master of science with major in veterinary clinical science and minor work for students majoring in other departments Within the veterinary clinical sciences major the student may specialize in veterinary medicine swine production medicine surgery radiology or theriogenology The D V M degree or equivalent is prerequisite to major graduate work

Both thesis and nonthesis options are available and require the completion of a minimum of 30 graduate credits and a final *examination*

Foreign language requirements may be established by the student s program of study committee

Courses Primarily for Undergraduate Students

385 Seminar (1-0) Cr R F S *Prereq Classification in veterinary medicine* Seminars and case discussions on selected clinical subjects by staff and fourth year students of the College of Veterinary Medicine Offered on a satisfactory fail basis only

391 Radiology (2 0) Cr 1 S 8 weeks *Prereq First year classification in veterinary medicine* Essentials of radiology and radiobiology Includes radiography fluoroscopy and clinical and biological uses of x radiation and radioisotopes with special emphasis on protection from radiation and interpretation of radiographs

397 Surgery and Anesthesiology (4-0) Cr 4 S *Prereq Second year classification in veterinary medicine* Principles of surgery and anesthesiology

401 Advanced Small Animal Orthopedics (1 0) Cr 1 S *Prereq Third year classification in veterinary medicine* Elective course in advanced small animal orthopedics

402 Electrocardiology (1-0) Cr 1 S *Prereq Third year classification in veterinary medicine* Elective course in electrocardiology

403 Equine Medicine and Surgery (1 0) Cr 1 F *Prereq Third year classification in veterinary medicine* Elective course in equine medicine and surgery

404 Large Animal Reproduction (1 0) Cr 1 S *Prereq Third year classification in veterinary medicine* Elective course in large animal reproduction

405 Introduction to Pet Birds (1 0) Cr 1 F *Prereq Third year classification in veterinary medicine* Elective course in management and diseases in pet birds

407 Feline Internal Medicine (1 0) Cr 1 F *Prereq Fourth year classification in veterinary medicine* Elective course in feline internal medicine

413 Production Medicine Cr 4 S *Prereq Fourth year classification in veterinary medicine* Elective course in food animal production medicine with emphasis on monitoring disease disease prevention and production economics

414 Companion Animal Nutrition (1-0) Cr 1 S *Prereq Third year classification in veterinary medicine* Elective course in small animal and equine nutrition

415 Advanced Small Animal Dermatology (1 0) Cr 1 S *Prereq Third year classification in veterinary medicine* Elective course in Dermatology

418 Preceptorship in Production Medicine Cr 4 A *Prereq Fourth year classification in veterinary medicine 413* Elective course in production medicine applications in veterinary practices under the guidance of selected preceptors

420 Animal Welfare (2-0) Cr 1 Alt F offered 1993 first 8 weeks Guest speakers discuss topics pertaining to animal welfare

421 Biology and Diseases of Rodents and Rabbits (2 0) Cr 1 S 8 weeks *Prereq Second-third or fourth year classification in veterinary medicine* Husbandry management and common diseases of rabbits guinea pigs hamsters gerbils rats and mice

440 Introduction to Clinics (0 4) Cr R F S 8 weeks *Prereq Third year classification in veterinary medicine*

441 Special Surgery (4-0) Cr 4 F *Prereq Third year classification in veterinary medicine* Surgical diseases of domestic animals

443 Equine Lameness (1 0) Cr 1 F *Prereq Third year classification in veterinary medicine* Orthopedic diseases of the equine

444 Clinical Medicine I (5-0) Cr 5 F *Prereq Third year classification in veterinary medicine* Clinical diagnostic methods and consideration of diseases of domestic animals

445 Clinical Medicine II (5-0) Cr 5 S *Prereq Third year classification in veterinary medicine* Clinical diagnosis and treatment of diseases of domestic animals

447 Animal Reproduction Laboratory (0-4) Cr 1 F S 8 weeks *Prereq Third year classification in veterinary medicine*

448 Radiology (2 0) Cr 2 S *Prereq Third year classification in veterinary medicine* Essentials of diagnostic imaging and radiobiology with emphasis on diagnostic interpretation and protection from radiation

449 Surgery Laboratory (2-8) Cr 3 F S 8 weeks *Prereq Third-year classification in veterinary medicine*

450 Disturbances of Reproduction (3 0) Cr 3 F *Prereq Third-year classification in veterinary medicine* General principles of diseases causing disturbances in reproduction

453 Small Animal Medicine I Cr 3 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in small animal medicine

454 Small Animal Medicine II Cr 3 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in small animal medicine

455 Small Animal Soft Tissue Surgery Cr 2 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in soft tissue surgery

456 Small Animal Orthopedic Surgery Cr 2 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in orthopedic surgery

457 Equine Medicine Cr 3 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in equine medicine

458 Equine Surgery Cr 3 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in equine surgery

459 Food Animal Medicine and Surgery Cr 2 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in food animal medicine and surgery

460 Radiology Cr 3 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in veterinary radiology

461 Animal Reproduction Cr 2 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in animal reproduction

466 Anesthesiology Cr 3 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in small animal and large animal anesthesiology

467 Field Services Cr 2 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in field services

468 Intensive Care Cr 4 *Prereq Fourth year classification in veterinary medicine* Clinical assignment to provide supervision of hospital cases

requiring intensive care and including emergency cases

469 Special Senses Cr 2 *Prereq Fourth year classification in veterinary medicine* Clinical assignment in ophthalmology

470 Radiology Cr var *Prereq Fourth-year classification in veterinary medicine* Elective clinical assignment in veterinary radiology

471 Animal Reproduction Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in animal reproduction

472 Small Animal Medicine Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in small animal medicine

473 Small Animal Surgery Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in small animal surgery

474 Equine Medicine and Surgery Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in equine medicine and surgery

475 Veterinary Field Services Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in veterinary field services

476 Anesthesiology Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in small animal and large animal anesthesiology

477 Food Animal Medicine and Surgery Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in food animal medicine and surgery

478 Intensive Care Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in intensive care

479 Special Senses Cr var *Prereq Fourth year classification in veterinary medicine* Elective clinical assignment in ophthalmology

487 Livestock Disease Prevention (3-0) Cr 3 S *Prereq MIPM 202* A survey of diseases of large domestic animals including discussion of causes transmission and control Designed for students majoring in agricultural sciences

490 Independent Study Cr 1 to 5 *Prereq Permission of instructor and department chair*

495 Seminar Cr R F S *Prereq Fourth year classification in veterinary medicine* Seminars and case discussions on selected subjects by staff of the College of Veterinary Medicine and others including student presentations Offered on a satisfactory fail basis only

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

590 Special Topics Cr 1 to 3 *Prereq Permission of instructor*
A Medicine
B Surgery
C Theriogenology
D Radiology
E Anesthesiology

599 Creative Component Cr var *Prereq Enrollment in nonthesis master s degree program*

Courses for Graduate Students

604 Seminar Cr 1 F S

640 Advanced Radiology (2-0) Cr 2 F *Prereq 448* Detailed principles of clinical radiology with particular reference to radiographic interpretation

644 Advanced Animal Reproduction (1 3) Cr 2 Alt S offered 1994 *Prereq 447 450* A detailed study of reproductive diseases of the male animal

645 Advanced Animal Reproduction (1-3) Cr 2 Alt S offered 1995 *Prereq 447 450* A detailed study of reproductive diseases of the female animal

671 Advanced General Surgery (1 3) Cr 2 Alt S offered 1994 *Prereq 441* An advanced course designed to investigate and discuss the responses of the body to surgical and anesthetic procedures

672 Advanced Special Surgery (1 3) Cr 2 Alt S offered 1995 *Prereq 449* Advanced procedures in both clinical and research techniques in abdominal thoracic orthopedic cardiovascular and neurological surgery

676 Advanced Medicine (2 0) Cr 2 Alt F offered 1993 *Prereq 445* Principles of general medicine A study in depth of factors that contribute to the development of clinical signs as related to the pathogenesis of disease

677 Advanced Medicine (2-0) Cr 2 Alt F offered 1994 *Prereq 445* An advanced study of metabolic diseases

699 Research
A Medicine
B Surgery
C Theriogenology
D Radiology
E Anesthesiology

Veterinary Medicine

Richard F Ross Interim Dean
Donald D Draper Associate Dean
Gary D Osweiler Interim Associate Dean
Joan G Hopper Director of Laboratory Animal Resources

Courses listed below are offered to undergraduate students in the College of Veterinary Medicine

300 Professional Orientation (1-0) Cr R F *Prereq First-year classification in veterinary medicine*

402 Seminar in International Veterinary Medicine (1 0) Cr 1 S 8 weeks *Prereq Third year classification in veterinary medicine* Selected topics on international perspectives of veterinary medicine

451 Fundamental Microcomputer Applications in Veterinary Medicine (1-3) Cr 1 F S 8 weeks *Prereq Fourth-year classification in veterinary medicine* Introduction to microcomputer hardware and software for practice management Discussion and use of special application software available for word processing spreadsheet analysis and veterinary practice management

490 Independent Study Cr 1 to 3 *Prereq Classification in veterinary medicine* Independent or small group study of a specific area for which no course is available in an existing department
H Honors

Veterinary Pathology

John H Greve Interim Chair of Department

Professors Andrews Carson Cheville Greve Hagemoser D Hopper Kluge Ledet McKean L Miller Moon, Niyo Osweiler Seaton Stahr Trampel

Emeritus Professors Daniels Jeska

Associate Professors Anderson Cassidy Haynes Hyde Janke Jarvinen Larson Myers Wilson

Assistant Professors Ackerman Harbison Howard Sanderson

Instructors N Dyer Pendry Vahle

Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree doctor of veterinary medicine see *Veterinary Medicine Curriculum*

The Department of Veterinary Pathology offers a systematic study of basic disease mechanisms with emphasis on the changes in cells tissues organs and body fluids associated with disease Study of disease is complemented by courses in parasitology and toxicology The theory and practice of veterinary pathology and related disciplines provide the basis for accurate diagnosis and a rational approach to the treatment and prevention of animal diseases

Graduate Study

The department offers work for the degree master of science and doctor of philosophy with a major in veterinary pathology As an option students within the veterinary pathology major may choose an area of specialization in veterinary clinical pathology veterinary toxicology or veterinary parasitology The master of science degree is available on a thesis or nonthesis basis in the veterinary pathology major with or without an area of specialization

A minor in veterinary pathology requires a minimum of 12 graduate credits at the Ph D level and 8 graduate credits at the M S level Additionally a faculty member from the department must be a member of the student s program of study committee A veterinary degree (doctor of veterinary medicine or equivalent) is required for the major in veterinary pathology with or without an area of specialization A minimum score of 550 is required on the TOEFL examination for students whose native language is not English Scores on the standardized Graduate Record Examination (GRE) General Test are required of students not having a veterinary degree from the United States or Canada The GRE General Test is strongly recommended for all other applicants The foreign language requirement will be determined by the student s program of study committee with the approval of the departmental chair The Graduate English Examination is a graduate college requirement for native English speakers

The **M S thesis** degree in veterinary pathology with or without an area of specialization requires a minimum of 30 graduate credits Following completion of all other requirements a comprehensive final examination is administered covering all graduate work including the thesis The examination is typically oral but a written component may be specified by the program of study committee The degree candidate must submit a thesis including at least one manuscript suitable for publication, to the major professor at least one week prior to the final examination The departmental requirement for graduate courses includes 3 credits of basic biological sciences (biochemistry genetics cell biology) 4 credits of statistics (Stat 401) 4 credits of systemic pathology (from V Pth 570 or 571) 1 credit of postmortem pathology (V Pth 551) 1 credit of seminar (V Pth 605 or 500) and a practical diagnostic examination (V Pth 606) corresponding to the major and area of specialization and a significant number of research credits (V Pth 699)

The **M S nonthesis** degree in veterinary pathology with or without an area of specialization requires a minimum of 40

graduate credits including at least 10 *graduate credits earned outside the* department Every nonthesis master s degree program requires evidence of individual accomplishment demonstrated by completion of a creative component special report or scientific study A *minimum of 3 credits of* such independent work (V Pth 599) is required on every program of study The final examination is comprehensive and consists of written and oral questions The departmental requirement for graduate courses includes those for the M S thesis degree plus additional courses corresponding to the area of degree emphasis of specialization Contact the department for a more complete list of requirements and information on areas of specialization

The **Ph D** degree in veterinary pathology with or without an area of specialization requires a minimum of 72 graduate credits including at least 12 graduate credits earned outside the department A minor is encouraged but not required The preliminary examination, consisting of written and oral components is comprehensive and not restricted to the content of graduate courses The degree candidate must submit a dissertation including at least two manuscripts suitable for publication to the major professor at least one week prior to the final examination The final examination is primarily a defense of the dissertation but it may include questions on other areas of *specialized knowledge* The departmental requirement for graduate courses includes those for the M S thesis degree plus 3 additional credits in basic biological sciences and the recommendation for 3 additional *credits in statistics* (Stat 402) *Additional* courses corresponding to areas of degree emphasis of specialization and a significant number of credits as research (V Pth 699) are required for all degree options Contact the department for a more complete list of requirements and information on areas of specialization

Minor work is recommended in other departments in the College of Veterinary Medicine or departments or programs in other colleges The department participates in the interdepartmental program in immunobiology and the interdepartmental major in toxicology (See *Index*)

Courses Primarily for Undergraduate Students

***342 (542 DL) General Pathology** (3 2) Cr 2 S 8 weeks *Prereq First year classification in veterinary medicine Offered second half semester only* Basic pathology with emphasis on disease in animals

372 Systemic Pathology (2-3) Cr 3 F *Prereq Second year classification in veterinary medicine* Response to injury by each body system

***376 (576 DL) Veterinary Parasitology** (4 3) Cr 5 S *Prereq Second year classification in veterinary medicine* Parasitic diseases of domestic animals and their control

401 Basics of Medical Terminology (1-0) Cr 1 F Discussion of prefixes suffixes and roots (mostly from Latin and Greek) that comprise medical terms

402 Introduction to Clinical Problem Solving (0-4) Cr 2 F *Prereq First year classification in veterinary medicine* Application of knowledge in basic biomedical sciences to clinical problems using a small group problem based learning format

404 Neoplasia in Domestic Animals (1-0) Cr 1 S 8 weeks offered first half semester only *Prereq 342* Specific neoplastic diseases of domestic animals are discussed after introductory lectures on the biology of neoplastic cells carcinogens and effects of neoplasia on the host Special emphasis is given to skin tumors of dogs and cats

406 Surgical Pathology (1-0) Cr 1 each time taken S *Prereq 372* Biopsies and associated cases reviewed with students in a seminar format Interpretation of histopathologic findings as an adjunct to diagnosis prognosis and management of clinical cases

407 Parasites of Laboratory and Exotic Animals (1-0) Cr 1 F *Prereq Third- or fourth year classification in veterinary medicine* Discussion of important parasitisms occurring as natural infections in laboratory animals and exotic pet animals Rodents primates reptiles and caged birds are examples of hosts discussed

408 Clinical Pathology Interpretation (1 0) Cr 1 S *Prereq 425* Interpretation of laboratory data on a series of clinical cases supplemented by current literature review

409 Introduction to Veterinary Cytology (1-0) Cr 1 F S *Prereq 342* Description and interpretation of cellular preparations from tissues and body fluids

422 Special Pathology (3 3) Cr 4 S *Prereq 372* Pathogenesis of diseases in domestic animals

425 Clinical Pathology (1-4) Cr 3 F *Prereq 372* Principles of clinical hematology and clinical chemistry in domestic animals

***426 (526 DL) Veterinary Toxicology** (3-0) Cr 3 S *Prereq Third year classification in veterinary medicine* A study of the disease processes in animals caused by toxicants and the use of differential diagnostic and therapeutic procedures

455 Diagnostic Laboratory Practicum Cr 2 each time taken *Prereq Fourth year classification in veterinary medicine* Practical experience in diagnosis of field cases Offered on a satisfactory-fail basis only

456 Necropsy Laboratory Practicum Cr 1 each time taken *Prereq Fourth-year classification in veterinary medicine* Practicum in postmortem examination and diagnosis

457 Clinical Pathology Laboratory Practicum Cr 1 each time taken *Prereq Fourth year classification in veterinary medicine* Methodology in clinical chemistry hematology and cytology practice in interpretation of laboratory data

490 Independent Study Cr arr *Prereq Permission of instructor and department chair*

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

500 Toxicology Seminar (Tox 500) (1 0) Cr 1 F S *Prereq Permission of instructor* Current topics in toxicology Seminars by outside speakers faculty and students covering contemporary issues in toxicology

501 Principles of Toxicology (Tox 501 Zool 501) (3-0) Cr 3 S *Prereq Biochemistry 404 or equivalent* Principles of toxicology governing entry fate and effects of toxicants on living systems Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification Fundamentals of foreign compound effects on metabolism physiology and morphology of different cell types tissues and organ systems

502 Toxicology Methods (Tox 502 Zool 502) (0-6) Cr 3 Alt F offered 1993 *Prereq 501* Provides demonstrations or laboratory experience in the application of methods used in toxicology including safety procedures calculation and data analysis mutagenicity tests cell culture residue analysis teratologic and morphologic evaluation electrophysiologic measures in vitro enzyme induction/biotransformation neural and behavioral toxicology testing

***526 (426 DL) Veterinary Toxicology** (Tox 526) (3-0) Cr 3 S *Prereq Graduate classification and 542* A study of disease processes in animals caused by toxicants and the use of differential diagnostic and therapeutic procedures

***542 (342 DL) General Pathology** (3 2) Cr 2 S 8 weeks offered second half semester only *Prereq Graduate classification and V An 305 306 or Zool 322 For graduate credit open only to students who do not have or are not pursuing the D V M degree* Basic pathology with emphasis on disease in animals

546 Clinical and Diagnostic Toxicology (Tox 546) (0-3 to 0 9) Cr 1 to 3 F S SS *Prereq D V M degree or 526* Advanced study of current problems and issues in toxicology Emphasis on problem solving utilizing clinical epidemiological and laboratory resources

548 Diagnostic Parasitology Laboratory (0-3 to 0-9) Cr 1 to 3 F S SS *Prereq 376 or 576* A laboratory experience in the technical and applied aspects of veterinary parasitology

549 Clinical Pathology Laboratory (0-3) Cr 1 F S SS *Prereq 457* Laboratory procedures and clinical interpretations with emphasis on hematology cytology and clinical chemistry Offered on a satisfactory fail basis only

550 Surgical Pathology Laboratory (0 3 to 0-9) Cr 1 to 3 F S SS *Prereq 422 570 or 571* Diagnosis of lesions in biopsy specimens classification of neoplasms Course includes rotation through departmental biopsy service and review of selected cases from departmental archives Offered on a satisfactory fail basis only

551 Postmortem Pathology Laboratory (0-3 to 0-9) Cr 1 to 3 F S SS *Prereq 542 or 422* Necropsy techniques of animals with emphasis on gross and microscopic lesions and diagnosis Offered on a satisfactory fail basis only
A Veterinary Pathology
B Veterinary Diagnostic Laboratory

555 Neurobehavioral Toxicology (3-0) Cr 3 Alt F offered 1993 *Prereq 501* Advanced study of neurotoxicology and behavior Emphasis on methods in neurobehavioral toxicology and the effects of a broad spectrum of neurotoxic agents

558 Laboratory Techniques in Pathology (1 3) Cr 2 F S SS *Prereq 342 or 542 or B B 404* Theory and practice of light microscopy such as histologic techniques immunocytochemistry *lectin staining in situ* hybridization and photomicroscopy

570 Systemic Pathology I (2-4) Cr 1 to 4 Alt F offered 1993 *Prereq 342 or 542* Pathology of the respiratory reproductive endocrine musculoskeletal and cardiovascular systems Emphasis on pathogenesis and anatomic pathology correlated with interpretive clinical pathology where appropriate

571 Systemic Pathology II (2-4) Cr 1 to 4 Alt F offered 1994 *Prereq 342 or 542* Pathology of the integumentary urinary digestive lymphoid and nervous systems and special senses Emphasis on pathogenesis and anatomic pathology correlated with interpretive clinical pathology where appropriate

***576 (376 DL) Veterinary Parasitology** (4-3) Cr 5 S *Prereq Graduate classification and 542 For graduate credit open only to students who do not have or are not pursuing the D V M degree* Parasitic diseases of domestic animals and their control

590 Special Topics Cr 1 to 3 F S SS *Prereq Permission of instructor*
A Veterinary Pathology
B Veterinary Parasitology
C Veterinary Toxicology
D Veterinary Clinical Pathology

599 Creative Component Research
A Veterinary Pathology
B Veterinary Parasitology
C Veterinary Toxicology
D Veterinary Clinical Pathology

*See description of dual listed (DL) courses p 119

Courses for Graduate students, major or minor

604 Pathology Case Seminar Cr 1 to 2 F S Description and interpretation of microscopic lesions and clinical pathology data collected from cases of natural and experimental disease

605 Current Topics Seminar Cr 1 F S

606 Diagnostic Interpretation Cr R F S SS A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization
A Veterinary Pathology
B Veterinary Parasitology
C Veterinary Toxicology
D Veterinary Clinical Pathology

641 Organic Pesticide Toxicology (2-0) Cr 2 Alt F offered 1993 *Prereq Courses in biochemistry and physiology* Organic pesticides as related to biologic effects in animals of economic importance public health hazards and environmental effects

643 Natural Toxins (1-6) Cr 3 Alt F offered 1994 *Prereq Courses in biochemistry and physiology* Naturally occurring toxins in foods and feeds poisonous plants and venoms

645 Agricultural and Environmental Analytical Toxicology (1-3) Cr 2 F *Prereq Chem 211 322* Analysis and interpretation of toxicant residues in animal tissues feeds water soil and other environmental specimens

652 Pathologic Hematology (2-2) Cr 3 Alt S offered 1993 *Prereq 425* Pathologic changes in blood constituents of domestic animals

655 Cellular and Molecular Pathology I (2 0) Cr 2 Alt S offered 1993 *Prereq Graduate course in biochemistry genetics or cell biology* Cellular and molecular mechanisms of cell injury circulatory dysfunction and the inflammatory response

656 Cellular and Molecular Pathology II (2-0) Cr 2 Alt S offered 1994 *Prereq Graduate course in biochemistry genetics or cell biology* Cellular and molecular mechanisms of neoplasia and toxicologic pathology

660 Pathology of Parasitic Diseases (2 3) Cr 3 Alt SS offered 1994 *Prereq 372 376* Gross and microscopic tissue changes caused by parasitic arthropods and helminths

663 Clinical Chemistry (2-2) Cr 3 Alt S offered 1994 *Prereq 425* The pathophysiology methodology and clinical application of laboratory medicine

679 Histopathology of Laboratory Animals (0-4) Cr 2 Alt SS offered 1994 *Prereq 570 or 571* Study of microscopic lesions in laboratory animals with emphasis on description etiology pathogenesis and diagnosis

699 Research
A Veterinary Pathology
B Veterinary Parasitology
C Veterinary Toxicology
D Veterinary Clinical Pathology

Veterinary Physiology and Pharmacology

Richard L Engen Chair of Department

Professors Ahrens Allison Dixon Dougherty Dyer, Engen Hembrough Hsu McCormack Pineda Randic Reece Taylor VanMeter Whipp

Emeritus Professors Swenson

Associate Professors Crump Martin Sharp

Assistant Professors Goff

Undergraduate Study

For undergraduate curriculum in veterinary medicine leading to the degree doctor of veterinary medicine, see *Veterinary Medicine, Curriculum*

A thorough study of basic physiology is necessary to understand the mechanisms and the treatment of animal diseases The study of comparative mammalian physiology gives students a background in the functional activities of cells tissues, organs and systems with special consideration for the basic physiology of importance to veterinary medicine

An understanding of drug action is essential for rational drug therapy The general pharmacology courses provide students with a background in basic pharmacology to include pharmacodynamics toxicology and the clinical application of drugs Special emphasis is placed on chemical agents and therapeutic practices specific to veterinary medicine

Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in physiology or in physiology with pharmacology as a specialization and minor work for students majoring in other disciplines Graduate study is available for the student with a B S or an equivalent degree and for the veterinary medical student who wishes to pursue a joint degree

Cooperative programs between Veterinary Physiology and Pharmacology and the Biomedical Engineering Program are provided jointly under sponsorship by the colleges of Engineering and Veterinary Medicine See *Biomedical Engineering* The department also participates in the interdepartmental majors in molecular, cellular and developmental biology and in toxicology and the interdepartmental program in neuroscience Fundamental knowledge of anatomy biochemistry chemistry mathematics physiology and zoology is considered prerequisite for major study in the department

Foreign language requirements may be established by the student s program of study committee

Open to graduate students for minor credit only 360 401 402

Courses Primarily for Undergraduate Students

229 Physiology of Domestic Animals (3-3) Cr 4 F S *Prereq Biol 201 or An S 214* Fundamentals of physiology and their application to domestic animals Designed for students in agricultural sciences and preveterinary medicine

349 Comparative Veterinary Physiology (3-4) Cr 4 S *Prereq First-year classification in veterinary medicine* Physiology of the endocrine system blood body fluids kidneys respiration and acid base balance Laboratories offered biweekly and alternate with laboratories of 350

350 Comparative Veterinary Physiology (3-4) Cr 4 S *Prereq First-year classification in veterinary medicine* Membrane neural muscular and cardiovascular physiology Alimentary physiology including motility and secretion Laboratories offered biweekly and alternate with laboratories of 349

353 Comparative Veterinary Physiology (2-3) Cr 3 F *Prereq 349 350* Continuation of alimentary physiology with emphasis on ruminant and monogastric digestive processes and reproductive physiology of domestic animals including reproductive patterns

***360 General Pharmacology (560 DL)** (4-3) Cr 5 F *Prereq 350 or 552* General principles drug disposition drugs acting on the nervous cardiovascular renal gastrointestinal and endocrine systems antimicrobials and antineoplastics

361 Pharmacology and Therapeutics (2-0) Cr 1 S 8 weeks *Prereq 360* Pharmacology and therapeutic uses of fluids antiparasitic drugs and selected drugs in veterinary practice

401 Reproductive Management of the Dog and the Cat Contraception and Contraceptives (1-0) Cr 1 S *Prereq 353 or An S 331* Pineda Reproductive management and methods for the control of dog and cat populations Social economical and ecological aspects of controlling pet populations are emphasized

402 The Physiology of Gastrointestinal Disturbances (2-0) Cr 1 F Second 8 weeks *Prereq 350* Crump Gastrointestinal abnormalities associated with motility secretion absorption and digestion with emphasis on neonatal animals such as the puppy pig and calf

490 Independent Study Cr 1 to 5 each time taken *Prereq Permission of instructor*
H Honors

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501, 502 Selected Research Methods in Pharmacology (0 8) Cr 3 each 501 F 502 S *Prereq Graduate classification permission of pharmacology staff* Experience in pharmacologic techniques in selected pharmacology laboratories cytochemical methods extracellular and intracellular unit recording microiontophoresis spectrophotofluorometric analysis of biogenic amines atomic absorption spectrometry radioimmunoassay gas chromatography enzyme analysis use of isotopes in drug studies intestinal perfusion techniques renal clearance methods and isolated tissue bioassay

531 Physiology and Pharmacology of Synaptic Transmission (2-0) Cr 2 Alt S offered 1994 *Prereq 551 permission of instructor* Randic and VanMeter Anatomical distribution actions biochemical aspects of synthesis and degradation release of possible transmitter substances in mammalian central nervous system Several amino acids acetylcholine catecholamines 5-hydroxytryptamine and some peptides of interest in neurobiology Various drugs will be introduced where their action is related to the subject under discussion

535 Advanced Animal Reproduction (3-0) Cr 3 Alt S offered 1994 *Prereq 551* Physiology and endocrinology of animal reproduction Neuroendocrinology physiology of pregnancy cell and molecular biology

545 Electrophysiology (BME 545) (2-0) Cr 2 S *Prereq 551 Math 176 Phys 222* Electrical events in living systems

551 Advanced Vertebrate Physiology I (B M E 551 Zool 551) (4-0) Cr 4 F *Prereq 355 320 or B M E 525 credit or enrollment in B B 420 or 404* Neurophysiology sensory systems muscle neuroendocrinology endocrinology

551L Advanced Vertebrate Physiology Lab (B M E 551L Zool 551L) (0 3) Cr 1 F *Prereq Credit or enrollment in 551* Electrophysiological techniques principles of nervous system and endocrine function

552 Advanced Vertebrate Physiology II (B M E 552 Zool 552) (4-3) Cr 5 S *Prereq 355 320 or B M E 525 credit or enrollment in B B 420 or 404* Cardiovascular renal respiratory physiology and digestion

*560 (360 DL) General Pharmacology (4-3) Cr 5 F *Prereq 551 and 552 B B 404 405* Graduate study in conjunction with 360 General principles drug disposition drugs acting on the nervous cardiovascular renal gastrointestinal and endocrine systems antimicrobials and antineoplastics

565 Autonomic Physiology and Pharmacology of Smooth Muscle (2-0) Cr 2 Alt S offered 1995 *Prereq 551 552 and permission of instructor* Dyer The regulation of vascular smooth muscle by the autonomic nervous system and autocoids Drug receptor mechanisms

590 Special Topics Cr 1 to 7 *Prereq Permission of instructor*
A Physiology
B Pharmacology

*See description of dual listed courses p 119

Courses for Graduate Students, major or minor

630 Alimentary Physiology (3-0) Cr 3 Alt S offered 1994 *Prereq 552* Crump staff A comparative study of ruminants and non-ruminants with emphasis on motility secretion digestion and absorption

631 Experimental Techniques in Physiology (2-6) Cr 4 Alt SS offered 1995 *Prereq 552* Hembrough staff Possession of surgical skills recommended Basic physiology in animals utilizing various techniques such as fistulas bypasses blood flow determinations and others

652 Respiratory Physiology (2 1) Cr 3 F *Prereq 552* Engen Review of current research literature on hemodynamics of respiratory system lung mechanics gas diffusion surfactant and related topics

667 Qualitative Pharmacology Isolated Tissues (0-8) Cr 4 S *Prereq 360 or 560 permission of instructor* VanMeter Laboratory experiments using a variety of isolated smooth muscle cardiac and nerve muscle preparations to study qualitative drug responses Emphasis on technique and reporting of laboratory data

668 Quantitative Pharmacology Bioassay (0-8) Cr 4 S *Prereq 667* VanMeter Pharmacological experiments designed to assay agonists and antagonists using principles and techniques of biological standardization and biostatistics

688 Research Review Cr 1 F S A forum for VPP students to gain experience in the critical exchange of ideas through oral presentation and discussion of scientific information Offered on satisfactory fail basis only

690 Advanced Topics Cr 1 to 5 *Prereq Permission of instructor*
A Physiology
B Pharmacology

698 Seminar Cr 1 F S SS Staff Offered on satisfactory fail basis only

699 Research
A Physiology
B Pharmacology

Veterinary Preventive Medicine

(Interdepartmental Graduate Program administered by the Department of Microbiology, Immunology and Preventive Medicine)

Program Committee G W Beran Chair N R Hartwig H T Hill M L Kaeberle C O Thoen R W Griffith *ex officio*

Graduate Study

Work is offered for the degree master of science with major in veterinary preventive medicine (with or without thesis) This objective may be pursued as a co-major with veterinary clinical sciences or in conjunction with study for the D V M degree Work is offered for the doctor of philosophy degree in veterinary microbiology (preventive medicine) Faculty members encompass multiple areas of emphasis in epidemiology public health production medicine regulatory veterinary medicine environmental health food safety zoonoses statistical modeling and laboratory biosafety Facilities include both specialized laboratories and field access

Students desiring to major in veterinary preventive medicine must have the D V M or equivalent and qualify for admission in the Department of Microbiology Immunology and Preventive Medicine (MIPM) Alternatively students enrolled in veterinary medicine may be accepted into the preventive medicine program and work concurrently toward both degrees Submission of scores on the GRE General Test is required and the GRE Biology Test is recommended

The course of study and plan of independent investigation are developed with each student's program of study committee to include coursework in epidemiology zoonoses and environmental health medical immunology statistics and pathogenic microbiology Candidates for the Ph D Degree are encouraged to complete a minor in statistics See *MIPM* for the full list of departmental courses and requirements

Water Resources

(Interdepartmental Graduate Major)

Supervisory Committee W G Crumpton Chair T Al Austin J L Baker J A Herriges W W Simpkins

Water resources is a university-wide interdisciplinary program involving biological physical and social sciences Faculty from departments in the colleges of Agriculture Engineering and Liberal Arts and Sciences cooperate to offer courses and research opportunities leading to the M S and Ph D degrees with a major in water resources

Although broadly trained water resources majors specialize in some technical aspect of water resources and applicants should have completed the equivalent of an undergraduate or masters degree in one of the biological physical or engineering sciences

The water resources program emphasizes fundamental concepts and research which at the same time address water resources issues having regional and national significance The curriculum is designed to provide the interdisciplinary approach needed in water resources education and research In addition to work in their chosen area of specialization, students may obtain a broad background in water resources encompassing physical chemical, and biological aspects of water resources Cooperating departments offer courses covering surface and groundwater hydrology climatology water quality, aquatic and wetland ecology water resources engineering and sociological political and economic aspects of water resources planning and management

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

579 Water Resources Planning and Management (Econ 579) (3 0) Cr 3 S *Prereq Graduate classification* Legal economic sociological governmental and technical aspects of water resources planning and management water management categories and beneficial use groups Emphasis on systems of rational allocation among competing demands for water

590 Special Topics Cr var *Prereq Permission of major professor in water resources faculty* Literature reviews and conference in accordance with needs and interest of the student

599 Creative Component Cr var *Prereq Permission of major professor in water resources faculty* Creative component for nonthesis master of science degree

690 Seminar in Water Resources Management (1-0) Cr 1 F S *Prereq Permission of the instructor*

Women's Studies

(Interdepartmental Undergraduate Program)

Program Committee Kathleen Hickok Chair B Daly M Henry C Pope two graduate and two undergraduate student members

Undergraduate Study

Women s studies in the College of Liberal Arts and Sciences is a cross-disciplinary program in which students may elect a minor area of study or develop an interdisciplinary studies major Women s studies provides an opportunity for students to examine women s roles contributions and status in a social and cultural context and to investigate a variety of disciplines from a feminist perspective The program includes courses in art history classical studies economics, English foreign languages and literatures history physical education political science psychology sociology zoology and women s studies

Current women s studies courses are listed below Undergraduate students may minor in women s studies by taking 15 semester hours of women s studies classes including W S 201 301 or 401 Because course listings may vary from year to year any student interested in a minor or interdisciplinary studies major in women s studies should contact the chair of the program committee for advising (See *Index Cross-Disciplinary Programs*)

The following women's studies courses are applicable to the human relations requirement for teachers 201 327 340 345, 346 385 386 (See *Index Professional Teacher Education Requirements*)

Graduate Study

The following courses may be used in graduate programs with the approval of the student s program of study committee 340 345 401 446 and 450

Courses Primarily for Undergraduate Students

201 Introduction to Women's Studies (3-0) Cr 3 F S The status of women today from social economic historical political philosophical and literary perspectives Analysis of theory and practice

of gender systems Background for the other courses in the program

258 Human Reproduction (Zool 258) See *Zoology*

301 Gender and Culture (3-0) Cr 3 F *Prereq 201 or 3 credits in women s studies at the 300 level or above* Cross-cultural definitions of gender their evolution and function Strategies for adaptation and change

327 Sex and Gender in Society (Soc 327) See *Sociology*

340 Survey of Women s Literature (Engl 340) See *English*

341 Women Men, and the English Language (Engl 341) See *English*

345 Women and Literature Selected Topics (Engl 345) See *English*

346 Psychology of Women (Psych 346) See *Psychology*

370 French Studies in English (Frnch 370) See *Foreign Languages and Literatures* Acceptable only when offered as a course on women or feminism in French literature

374 Women in Classical Antiquity (Cl St 374) See *Classical Studies*

385 Women in Politics (Pol S 385) See *Political Science*

386 History of Women in America (Hist 386) See *History*

394 Women in Art (Art H 394) See *Art History*

401 Feminist Theories (3-0) Cr 3 S *Prereq 301* Historical and current theories of sexual difference exploration of problems in ethics language culture and social relations from a feminist perspective

446 Economics of Discrimination (Econ 446) See *Economics*

450 Topics in Women s Studies (3 0) Cr 3 each time taken maximum of 6 *Prereq 201 or 3 credits in women s studies at the 300 level or above* Special and/or experimental topics in a specific discipline e g women and education women and religion women and the law

490 Independent Study Cr 1 to 3 each time taken maximum of 6 *Prereq Any two courses in women s studies permission of instructor* The chair of the Women s Studies Program Committee must be consulted in advance

Courses for Graduate Students, major or minor, open to qualified undergraduates

523 Gender Roles and Sport (P E 523) See *Physical Education*

528 Sociology of Gender (Soc 528) See *Sociology*

545 Studies in Women's Literature (Engl 545) See *English*

589A Seminar (Engl 589A) See *English* Acceptable only when offered as a course in literature by or about women or in feminist criticism

590 Special Topics Cr var *Prereq Permission of Women s Studies Program Committee* Independent study on a topic in women s studies

594 Women in Art (Art H 594) See *Art History*

Zoology and Genetics

M Duane Enger Chair of Department

Professors Ackerman, Atherly Benbow Bishop Brown Dolphin, Drewes Enger Hoffmann Imsande Mayfield Miller Palmer Peterson, Pollack Redmond Shen, Stadler

Emeritus Professors Hicks Hollander Jeska Mutchmor Robertson Ulmer, Welshons

Associate Professors Emery Farrar Ford Girton, Hamilton Haydon Ingebritsen, Jacobson, Lee Minion Myers, Powell Shaw Shoemaker Viles

Assistant Professors Ambrosio Bahls, Bowen, Harkins Henderson J Johansen K Johansen, Kosslak Larson, McCloskey Pleasants Sakaguchi Schnable, Voytas

Instructor Tatum

Undergraduate Study

The department offers majors in both genetics and zoology Each major is available to students in both the College of Agriculture and the College of Liberal Arts and Sciences The programs for these majors are listed below and under the *Curricula in Agriculture* College requirements can be found under *Curricula in Agriculture* and *Curriculum in Liberal Arts and Sciences* The department also offers minors in both genetics and zoology and B S /M S programs in which a student with proper planning can complete the requirements for both bachelor's and master's degrees in five years

Beginning in the fall term of 1993 a unified biology core is being instituted This core consists of four semesters of training in basic biological principles The first year (Biol 201 202) provides a broad introduction to the nature of life The second year (Biol 301 302) provides an integrated foundation in the principles of genetics cell biology and elementary biochemistry All biology botany genetics and zoology majors are required to complete this core sequence as part of their major requirements

Training in either genetics or zoology may lead to employment in teaching research, or any of a variety of health related professions In most cases students should plan on continuing their education in graduate or professional school Students with the B S degree may expect to find employment in the biotechnology health, or food industries Recent graduates have also developed careers in conservation biology technical writing science journalism technical sales biological illustration and genetic counseling

The respective communications and English proficiency requirements of both colleges are met by an average of C or better in Engl 104 105 or 105H and an additional English writing course The lowest grade acceptable in any of these courses is C— Agriculture students must also achieve a C or better in an oral communications course

A grade of C– or better is required in all biological science courses within the majors with a cumulative GPA of at least 2 0

Specific entrance requirements for medical and health-related professions are established by the professional schools Students interested in fulfilling preprofessional requirements for such professions as cytotechnology, dental hygiene, dentistry human medicine, medical technology nursing optometry pharmacy physical therapy physicians assistant and veterinary medicine can major in either genetics or zoology while fulfilling the preprofessional requirements (See *Preprofessional Study*)

Genetics

Genetics is the scientific study of heredity The understanding of heredity is fundamental to all the biological sciences The department offers a full range of instruction in all aspects of genetics from the molecular genetics of microorganisms to population genetics

In addition to basic degree requirements listed in the Curricula in Agriculture or the Curriculum in Liberal Arts and Sciences, genetics majors must satisfy the following requirements

1 Biol 201 201L 202 202L 301 301L, 302 302L 403 and MIPM 202

2 Gen 110 410 411 491 and 460 or 462

3 Eleven credits of calculus and statistics including at least one course in each

4 Three years of chemistry and biochemistry

5 One year of general college physics

6 Twelve credits for the degree in the College of Agriculture and 6 credits for the degree in the College of Liberal Arts and Sciences of support electives chosen from an approved list

7 Liberal Arts and Sciences majors must take one course that involves both humanities and biology such as history of science or bioethics This course may also count toward a college group requirement A list of acceptable courses is available from the departmental office

The department offers a minor in genetics that may be earned by completing Biol 301 301L 302 302L Gen 410 411 and 491

Zoology

The study of zoology includes all aspects of animal life The department offers instruction in a wide range of zoological subjects ranging from the structure and function of cells to the behavior of animals and their populations

In addition to the basic degree requirements listed in the Curricula in Agriculture and the Curriculum in Liberal Arts and Sciences zoology majors (including those preparing for professional programs in medical and other health-related fields) must complete satisfactorily the following requirements

1 Biol 201, 201L 202 202L, 301 301L, 302, 302L and Zool 355

2 Zoology electives 18 credits in zoology at the 300 level or above are required including three laboratory courses and six of the 18 credits must be at the 400 level or above Biol 312 403 and Gen 462 are also acceptable electives A maximum of 4 credits of 490Z and 0 credits of 490S and 490U may be used toward the 18 credits however, only 2 credits of 490Z may be applied to the requirement of six 400 or above credits The 18 credits must also include at least one organismal course

3 Two years of chemistry or biochemistry including one year of general chemistry with laboratory and at least one semester of organic chemistry with laboratory

4 Eleven credits of calculus and statistics including at least one course in each

5 One year of general college physics

6 Liberal Arts and Sciences majors must take one course that involves both humanities and biology such as history of science or bioethics This course may also count toward a college group requirement A list of acceptable courses is available in the department office

7 Agriculture majors must take 6 credits of agricultural biology electives This requirement is satisfied by passing six credits at the 300 level or above from the departments of Animal Ecology, Animal Science or Entomology
Majors are encouraged to take advantage of special opportunities available in summer courses at the Iowa Lakeside Laboratory at Lake Okoboji and at the Gulf Coast Research Laboratory Ocean Springs Mississippi (See *Index*) Generally these credits may be *applied toward the zoology elective* requirement Interested students should consult their advisers

The department offers a minor in zoology which may be earned by receiving credit for Biol 301 301L 302, 302L Zool 355 and 3 additional zoology credits taken at the 300 level or above

Graduate Study

The department offers work for the master of science and doctor of philosophy degrees with majors in ecology and evolutionary biology, genetics molecular cellular and developmental biology toxicology and zoology The department also participates in the immunobiology and neuroscience interdepartmental programs All degrees require the completion of original research and a written thesis or dissertation For further information about each major see the appropriate catalog listing or write to the department

Students entering any graduate program in the department need a sound background in the biological physical and mathematical sciences and must be committed to research Applicants are required to submit Graduate Record Examination (GRE) scores for both the aptitude and the biology advanced tests

A student majoring in zoology may specialize in animal behavior cell biology molecular biology developmental biology, comparative physiology ecology endocrinology immunobiology neurobiology, parasitology or physiology

The requirements for the genetics major can be found under *Genetics* in the separate interdepartmental listing

Specific course requirements for advanced degrees depend largely upon previous training and experience in the major area of specialization There is no foreign language requirement Certification in the use of written English is required All graduate students must acquire teaching experience usually in laboratory courses as part of their graduate program

Open to graduate students for minor credit only Zool 355 428

Genetics (Gen)

Courses Primarily for Undergraduate Students

110 Genetics Orientation (1 0) Cr R F First 8 weeks Orientation to the area of genetics For students considering a major in genetics Specializations and career opportunities Offered on a satisfactory fail basis only

****260 Human Heredity and Society** (3-0) Cr 3 F *Prereq One semester of college biology or Anthr 202* A survey course in genetics for non-biology majors interested in heredity and its importance and implications to self and society Not recommended for those intending to take advanced courses in genetics

****301 Principles of Genetics** (Biol 301) See *Biology* Replaces Gen 330 (see below) starting in 1994-95

****301L Principles of Genetics Laboratory** (Biol 301L) See *Biology* Replaces Gen 330L (see below) starting in 1994 95

****330 Principles of Genetics** (3-0) Cr 3 F S Offered in 1993 94 only Replaced by Biol 301 in 1994-95 (see above) *Prereq Biol 110 or 202 two semesters of college chemistry* Introduction to the principles of transmission molecular and population genetics Mendelian inheritance linkage sex determination recombination gene structure and expression cloning quantitative and population genetics

****330L Principles of Genetics Laboratory** (0-3) Cr 1 S Offered in 1993 94 only Replaced by Biol 301L in 1994 95 (see above) *Prereq Credit or enrollment in 330* Illustration of genetic principles using microorganisms plants and animals Covers both transmission and molecular techniques Materials fee

***410 (510 DL) Transmission Genetics** (3-0) Cr 3 F *Prereq 301 or 330* The principles and practice of transmission genetics The Mendelian concept of the gene mutational analysis of gene function linkage and gene mapping genetic fine structure analysis chromosomal aberrations aneuploidy and polyploidy extrachromosomal inheritance analysis of genetic pathways genetics of quantitative traits

***411 (511 DL) Molecular Genetics** (3-0) Cr 3 S *Prereq 301 or 330* The principles of molecular genetics gene structure and function at the molecular level including regulation of gene expression genetic rearrangement and the organization of genetic information in prokaryotes and eukaryotes

***460 (560 DL) Mathematical Genetics** (2 0) Cr 2 S *Prereq Knowledge of elementary algebra and 301 or 320 or 330* Probability theory and its application to Mendelian population and quantitative genetics

***462 (562 DL) Evolutionary Genetics** (Zool 462) (2-0) Cr 2 Alt S offered 1995 *Prereq Biol 403* The genetic basis of evolutionary processes in higher organisms The role of genetic variation in adaptation natural selection adaptive processes and the influence of random processes on evolutionary change

490 Independent Study Cr arr *Prereq 301 or 320 or 330 junior or senior classification permission of instructor Students in the College of Agriculture may use no more than 6 credits of Gen 490 toward the total of 128 credits required for graduation students in the College of Liberal Arts and Sciences may count no more than 9 credits of Gen 490 toward graduation*
- G Genetics research Cr 1 to 5 each time taken
- S Attendance and critique of genetics seminars Cr 1
- U Laboratory teaching experience For students registering to be undergraduate laboratory assistants Cr 1 to 2

491 Undergraduate Seminar (1-0) Cr 1 F *Prereq Junior classification* The investigation of current issues in genetics Graduate school and employment opportunities discussed Practice in résumé writing and interview techniques Required for majors in genetics

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

***510 (410 DL) Transmission Genetics** (3-0) Cr 3 F *Prereq 301 or 330* The principles and practice of transmission genetics The Mendelian concept of the gene mutational analysis of gene function linkage and gene mapping genetic fine structure analysis chromosomal aberrations aneuploidy and polyploidy extrachromosomal inheritance analysis of genetic pathways genetics of quantitative traits

***511 (411 DL) Molecular Genetics** (3-0) Cr 3 S *Prereq 301 or 330* The principles of molecular genetics gene structure and function at the molecular level including regulation of gene expression genetic rearrangement and the organization of genetic information in prokaryotes and eukaryotes

520 Genetic Engineering (B B 520 MCDB 520) (3-0) Cr 3 F *Prereq 411 or B B 405* Strategies and methods of gene cloning restriction endonuclease mapping southern hybridization isolation and manipulation of plasmid DNA and detection of specific genes in bacteria

520L Genetic Engineering Lab (B B 520L) (0 9) Cr 3 S *Prereq 411 or B B 405* Laboratory methods of gene cloning restriction endonuclease mapping southern hybridization manipulation of plasmids and detection of specific genes Materials fee

536 537 Genetic Statistics (Stat 536 537) See *Statistics*

550 Population Genetics (An S 550) See *Animal Science*

***560 (460 DL) Mathematical Genetics** (2-0) Cr 2 S *Prereq Knowledge of elementary algebra and 301 or 320 or 330* Probability theory and its application to Mendelian population and quantitative genetics

***562 (462 DL) Evolutionary Genetics** (MCDB 562) (2-0) Cr 2 Alt S offered 1995 *Prereq Biol 403* Graduate study in conjunction with 462 The genetic basis of evolutionary processes in higher organisms The role of genetic variation in adaptation natural selection adaptive processes and the influence of random processes on evolutionary change

590 Special Topics Cr 1 to 3 *Prereq 301 320 or 330*

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*See page 119 for information on dual-listed courses

**Credit for graduation will not be allowed for more than one of the following 260 301 and 301L 330 and 330L See *Liberal Arts and Sciences Curriculum*

Courses for Graduate Students, major or minor

615 Molecular Immunology (B B 615) See *Biochemistry and Biophysics*

620 Advanced Molecular Genetics (MIPM 620 MCDB 620) (2-0) Cr 2 Alt F offered 1993 *Prereq 511 or B B 405* Detailed analysis of procaryotic and some eucaryotic genetic material at the molecular level including replication transcription repair recombination control of gene expression (bacterial and viral) and genetic engineering using restriction endonucleases

627 Cytogenetics and Advanced Plant Genetics (Agron 627) (3-0) Cr 3 Alt S offered 1995 *Prereq 510* An analysis of chromosomes and their involvement in crossing over chromosomal aberrations polyploidy and plant evolution Gene regulation cytoplasmic inheritance and genetic control of meiosis in plants

630 Developmental Genetics (MCDB 630) (3-0) Cr 3 F *Prereq 411 or B B 405* Genetics of developmental processes the molecular structure and function of developmental regulatory genes Techniques of genetic analysis of developmental systems

675 Nucleic Acid Structure and Function (B B 675) See *Biochemistry and Biophysics*

690 Seminar (1-0) Cr 1 each time taken F S *Prereq Permission of instructor* Reports of research and current literature

696 Seminar in Plant Physiology and Molecular Biology (Bot 696) See *Botany*

698 Seminar in Molecular Cellular, and Developmental Biology (MCDB 698) See *Molecular Cellular and Developmental Biology*

699 Research

Zoology (Zool)

Courses Primarily for Undergraduate Students

110 Zoology Orientation (1-0) Cr R F First 8 weeks Orientation to the area of zoology For students considering a major in zoology Specializations and career opportunities in the zoological sciences including medically related professions Offered on a satisfactory fail basis only

155 Basic Human Physiology and Anatomy (3 0) Cr 3 or (3 1) Cr 4 Students wishing coverage of the material at greater depth should take the 4-credit option F S SS *Prereq H S biology and chemistry or Biol 109 or 110 or 201 Biol 109 or 110 or 201 recommended* The structure and functions of human organ systems

156 Laboratory in Human Physiology and Anatomy (1-3) Cr 2 F S SS *Prereq Credit or enrollment in 155* Introduction to selected aspects of human anatomy and physiology through the use of models specimens and student conducted experiments Materials fee

206 General Zoology (4-3) Cr 5 F S SS *Prereq Biol 109 or 110 Not open to freshmen 1993 94 not open to freshmen or sophomores in 1994 95 Replaced by Biol 201 202 Credit for graduation will not be allowed for both 206 and Biol 202* Structure function diversity and evolutionary relationships of animals The laboratory covers functional anatomy classification and life history of selected animals Materials fee

258 Human Reproduction (3-0) Cr 3 F *Prereq 155 or Biol 109 or 110 or 201* Anatomy and physiology of human reproductive systems including fertility pregnancy and delivery

304 Animal Behavior (3-0) Cr 3 or (3 3) Cr 4 F *Prereq 206 or Biol 202* Ethological and socio-biological approaches to animal behavior Genetic and developmental aspects of behavior biological rhythms orientation (including navigation migration) communication and social behavior (mating aggression parental care) Laboratory techniques for observation description and analysis of animal activities Independent projects Materials fee

310 Brain and Behavior (Psych 310) See *Psychology*

311 Introduction to Parasitology (MIPM 311) (3 3) Cr 4 F *Prereq 206 or Biol 202* Biology and host-parasite relationships of major groups of animal parasites and techniques of diagnosing and studying parasites Materials fee

320 Comparative Chordate Anatomy (3-4) Cr 5 F *Prereq 206 or Biol 202* Selected chordates with emphasis on adaptation and evolution Materials fee

322 Vertebrate Histology (2-4) Cr 4 S *Prereq 206 or Biol 202 320 recommended* Microscopic structure of vertebrate tissues and organs with an introduction to histological techniques Materials fee

325 Molecular and Cellular Biology (4-0) Cr 4 F S *Prereq Biol 110L or 202 and organic chemistry Credit for graduation will not be allowed for both 325 and Biol 302* Principles of cell structure and function Replaced by Biol 302 spring 1995

334 Embryology (2-0) Cr 2 S *Prereq 206 or Biol 202* Basic principles and processes of development Descriptive comparative experimental and analytical embryology

334L Embryology Laboratory (0-3) Cr 1 S *Prereq Credit or enrollment in 334* Classical developmental anatomy of vertebrate embryos plus selected experiments on living embryos Materials fee

355 Principles of Physiology (3-3) Cr 4 F S *Prereq 206 or Biol 202 and credit or enrollment in Chem 231 or 331* Introduction to systemic functions with emphasis on vertebrates Materials fee

403 Biological Evolution (Biol 403) See *Biology*

***405 (505 DL) Invertebrate Biology** (3-0) Cr 3 or (3 3) Cr 4 F *Prereq 355* A general biology of the invertebrates Functional ecological developmental and evolutionary aspects of the invertebrate phyla Materials fee

428 Cell Biology (3-0) Cr 3 S *Prereq 325* Biological organization and function at the cellular level Emphasis on biomembranes

***433 (533DL) Developmental Biology** (3 0) Cr 3 F *Prereq 325* Analysis of development in selected eukaryotic organisms The most recent research on the molecular and cellular mechanisms of development

450L Developmental Biology Laboratory (1-6) Cr 3 Alt S offered 1995 *Prereq 325 and a course in biochemistry* Modern experimental techniques in molecular developmental biology Laboratory projects Emphasis on early development microinjection technology and modern nucleic acid procedures Materials fee

***454 (554 DL) General and Comparative Endocrinology** (3-0) Cr 3 or (3 3) Cr 4 S *Prereq 355 a course in biochemistry* Chemical integration of vertebrate organisms The structure development and evolution of the endocrine glands and the function and structure of their hormones Laboratory techniques for studying hormonal phenomena Laboratory experiments require animal surgery and involvement outside of scheduled class time Materials fee

***456 (556 DL) Neurobiology** (3-0) Cr 3 or (3-3) Cr 4 F *Prereq 355 or Psych 310 physics recommended permission of instructor to enroll in lab* Integration coding plasticity and development in nervous systems Materials fee

***459 (559 DL) Environmental Physiology** (3-0) Cr 3 or (3 3) Cr 4 Alt F offered 1993 *Prereq 355 physics recommended* Physiological adaptations to the environment with an emphasis on vertebrates Materials fee

***462 Evolutionary Genetics** (Gen 462) See *Genetics*

490 Independent Study *Prereq 15 credits in zoological sciences permission of instructor Students in the College of Agriculture may use no more than 6 credits of 490 toward the total of 128 credits required for graduation students in the College of Liberal Arts and Sciences may count no more than 9 credits of 490 toward graduation*

- S Attendance and critique of zoology seminars Cr 1
- U Laboratory teaching experience Cr 1 to 2 For students registering to be undergraduate laboratory assistants
- Z Zoology research Cr 1 to 5 each time taken

Courses Primarily for Graduate Students, major or minor, open to qualified undergraduates

501 Principles of Toxicology (Tox 501 V Pth 501) See *Toxicology* or *Veterinary Pathology*

502 Methods of Toxicology (Tox 502 V Pth 502) See *Toxicology* or *Veterinary Pathology*

***505 (405 DL) Invertebrate Biology** (3-0) Cr 3 or (3 3) Cr 4 F *Prereq 355* Graduate study in conjunction with 405 In-depth study of selected invertebrate groups analysis of current research topics Not open to students who have credit in 405 Materials fee

507 Advanced Animal Behavior (2-0) Cr 2 Alt S offered 1995 *Prereq 304* Analysis of current research in animal behavior with emphasis on communication and social behavior

510 Histology and Pathology of Fish Diseases (A Ecl 510) (2 3) Cr 3 Alt S offered 1994 *Prereq A course in vertebrate histology or ichthyology* Histology of teleost fishes pathogen biology and analysis of cell and tissue changes in the major teleost diseases Materials fee

512 Vertebrate Behavioral Ecology (A Ecl 512) See *Animal Ecology*

515 Ecology of Freshwater Invertebrates (A Ecl 515) See *Animal Ecology*

528 Cellular Growth and Regulation (MCDB 528) (3 0) Cr 3 F *Prereq Courses in cell biology and biochemistry* Cell cycle regulation of cell growth cell division membranes transport processes and regulation of cellular activities

***533 (433DL) Developmental Biology** (3-0) Cr 3 F *Prereq 325* Graduate study in conjunction with 433 Analysis of development in selected eukaryotic organisms The most recent research on the molecular and cellular mechanisms of development

534 Molecular Development and Differentiation (MCDB 534) (1-0 to 6 0) Cr 1 to 6 Repeat for a total of up to 6 credits F S Course is offered in modular form cannot repeat modules Each module is one credit *Prereq 533 and B B 404 strongly recommended Module A is required for other modules*

- A Strategies for Differentiation
- B Embryonic Axis Determination
- C Mammalian Development
- D Plant Growth Regulation I
- E Plant Growth Regulation II
- F Cell and Tissue Interactions

540 Signal Transduction (3-0) Cr 3 S *Prereq 528 B B 404* Mechanisms and components of cellular signal transduction including receptors G proteins second messengers protein phosphorylation other post translational protein modifications and transcriptional regulation

551 Advanced Vertebrate Physiology I (B M E 551 V P P 551) (4-0) Cr 4 F *Prereq 355 320 or B M E 525 credit or enrollment in B B 420 or 404* Neurophysiology sensory systems muscle neuroendocrinology endocrinology

551L Advanced Vertebrate Physiology I Lab (B M E 551L V P P 551L) (0-3) Cr 1 F *Prereq Credit or enrollment in 551* Electrophysiological techniques principles of nervous system and endocrine function Materials fee

552 Advanced Vertebrate Physiology II (B M E 552 V P P 552) (4-3) Cr 5 S *Prereq 355 320 or B M E 525 credit or enrollment in B B 420 or 404* Cardiovascular renal respiratory physiology and digestion

***554 (454 DL) General and Comparative Endocrinology** (3-0) Cr 3 or (3 3) Cr 4 S *Prereq 355 a course in biochemistry* Graduate study in conjunction with 454 Chemical integration of vertebrate organisms The structure development and evolution of the endocrine glands and the function and structure of their hormones Laboratory techniques for studying hormonal phenomena Laboratory experiments require animal surgery and involvement outside of scheduled class time Materials fee

***556 (456 DL) Neurobiology** (Neuro 556) (3 0) Cr 3 or (3-3) Cr 4 F *Prereq 355 or Psych 310 physics recommended permission of instructor to enroll in lab* Graduate study in conjunction with 456 Integration coding plasticity and development in nervous systems Materials fee

557 Advanced Neuroscience Techniques (Neuro 557) See *Neuroscience*

***559 (459 DL) Environmental Physiology** (3-0) Cr 3 or (3-3) Cr 4 Alt F offered 1993 *Prereq*

355 physics recommended Graduate study in conjunction with 459 Physiological adaptations to the environment with emphasis on vertebrates Materials fee

590 Special Topics Cr 1 to 5 each time taken *Prereq Permission of instructor*

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*See page 119 for a description of the rules pertaining to dual-listed (DL) courses

Courses for Graduate Students, major or minor

610 Current Topics in Parasitology Cr 2 to 3 each time taken *Prereq Permission of instructor* Critical analysis of current literature in selected fields of parasitology

631 Current Topics in Developmental Biology (MCDB 631) Cr 2 to 3 each time taken *Prereq 433* Presentations and discussion of selected research topics in developmental biology

632 Cellular Regulation (MCDB 632) Cr 2 to 3 each time taken *Prereq 528 540* Selected topics in signal transduction events molecular mechanisms and relation to cellular processes Includes cell recognition second messenger systems information integration and transfer cell cycle cell differentiation and pattern formation

650 Current Topics in Physiology Cr 2 to 3 each time taken *Prereq 355 permission of instructor* Topics from comparative physiology environmental physiology mammalian physiology selected physiological techniques

654 Advanced Endocrinology Cr 2 or 3 each time taken *Prereq 454 or 551 552* Selected aspects of endocrine function in vertebrates

660 Current Topics in Neurobiology and Behavior (Neuro 660) Cr 2 to 3 each time taken *Prereq Permission of instructor* Topics may include communication hormones and behavior neural integration developmental neurobiology neuroanatomy and ultrastructure sensory biology social behavior techniques in neurobiology and behavior

690 Seminar in Zoology Cr 1 each time taken Offered on a satisfactory-fail basis only Journal article critique and discussion by faculty and graduate students
A Cellular Molecular and Developmental Biology
B Invertebrate Zoology and Parasitology
C Neurobiology and Behavior
D Physiology
E Evolution

696 Research Seminar Cr 1 each time taken Offered on a satisfactory/fail basis only Research seminars by faculty and graduate students
A Cellular Molecular and Developmental Biology
B Invertebrate Zoology and Parasitology
C Neurobiology and Behavior
D Physiology
E Evolution

698 Seminar in Molecular, Cellular and Developmental Biology (MCDB 698) See *Molecular Cellular and Developmental Biology*

699 Research

Courses Offered at the Iowa Lakeside Laboratory

Written permission of the instructor is prerequisite to all courses offered at the Iowa Lakeside Laboratory For current information concerning courses registration and housing see the annual *Iowa Lakeside Laboratory Bulletin* This bulletin is usually available from participating departments after February 15 Numbers beginning with L indicate numbers used in the *Iowa Lakeside Laboratory Bulletin*

301L (L 101) Field Natural History Cr 5 SS Biological diversity and its causes lectures and field trips to native lake marsh forest and prairie habitats Measuring the environment sampling and identifying the organisms experimenting with the ecosystem understanding species interactions and appreciating influences of past and present climates and geological events on natural ecosystems of the region Intended for students with one course in biology

415L (L 120) Developmental Biology of Freshwater Invertebrates Cr 5 Alt SS offered 1995 *Prereq 12 credits in biology* Field collections lab cultures analytical and experimental procedures discussion of concepts and scientific reports

419L (L 129) Vertebrate Ecology and Evolution (A Ecl 419L) Cr 5 SS *Prereq 15 credits in zoology and ecology permission of instructor* Field studies of representative northwest Iowa vertebrates Observation and experimentation emphasize ecological histories by integrating concepts of functional morphology behavioral ecology and evolutionary biology

490Z Independent Study (See preceding section)

511L (L 107) Field Parasitology Cr 5 SS *Prereq 15 credits in zoology* Ecology and life history of protozoan helminth and arthropod parasites Field and laboratory investigations

590 Special Topics (See preceding section)

699 Research (See preceding sections)

Courses Offered at the Gulf Coast Research Laboratory, Ocean Springs, Mississippi

Written permission of the coordinator for the Gulf Coast Research Laboratory 201 Bessey Hall Iowa State University Ames Iowa 50011, is prerequisite to all courses offered at the Gulf Coast Laboratory Numbers in parentheses beginning with MAR are GCRL numbers

252G Marine Biology (Biol 252G) See *Biology*

407G (MAR 403) Marine Invertebrate Zoology Cr 3 SS *Prereq 16 credits in zoology including an introductory course in invertebrate zoology* Concentrated study of free living marine invertebrates of the Mississippi Sound and adjacent continental shelf of the northeastern Gulf of Mexico Emphasis on structure classification phylogeny larval development and functional processes

407LG (MAR403L) Marine Invertebrate Zoology Lab Cr 3 SS Lab to accompany 407G

420G (MAR 408) Marine Ichthyology Cr 3 SS *Prereq 16 credits in zoology including comparative anatomy* Principles involved in classification and taxonomy of marine and estuarine fishes

420LG (MAR 408L) Marine Ichthyology Lab Cr 3 SS Lab to accompany 420G

422G (MAR 430) Comparative Histology of Marine Organisms Cr 3 SS *Prereq Permission of instructor* Detailed study of the histological organization of representative marine organisms at the light and electron microscope levels

422LG (MAR 430L) Comparative Histology of Marine Animals Lab Cr 3 SS Lab to accompany 422G

461G (MAR 404) Parasites of Marine Animals Cr 3 SS *Prereq 311* Study of the parasites of marine and estuarine animals with emphasis on morphology taxonomy life histories and host-parasite relationships

461LG (MAR 404L) Parasites of Marine Animals Lab Cr 3 SS Lab to accompany 461G

The Faculty

ABBOTT, ERIC A, Professor of Journalism and Mass Communication B S 1967 Iowa State M S 1970 Ph D 1974 Wisconsin 1974 1987

ABELSON, A GEOFFREY Professor of Curriculum and Instruction B A 1964 M Ed 1970 Pennsylvania State Ph D 1976 Michigan 1976 1986

ABENDROTH ROBERT E Associate Professor of Civil Engineering B S 1966 M S 1968 Ph D 1983 Wisconsin 1983 1989

ABIAN, ALEXANDER Emeritus Professor of Mathematics M S 1954 Chicago Ph D 1956 Cincinnati 1967

ABOU GABAL MOUSTAFA Associate Professor of Microbiology Immunology and Preventive Medicine B V Sc 1962 Cairo (Egypt) Dr Med Vet 1970 Hanover (West Germany) 1974 1978

ABRAHAM, ROBERTA G Professor of English B A 1953 Cornell M A 1976 Iowa State Ph D 1981 Illinois 1976 1992

ABRAHAM WILLIAM H, Professor of Chemical Engineering B Ch E 1952 Cornell Ph D 1957 Purdue 1962 1967

ACHEBO NUBI K Assistant Professor Library B A 1981 Ife (Nigeria) M Ed 1985 East Tennessee State Ph D 1990 Southern Illinois M S L S 1991 Kentucky 1991

ACKERMAN RALPH A Professor of Zoology and Genetics B A 1967 Rutgers Ph D 1975 Florida 1981 1990

ACKERMANN MARK R Assistant Professor of Veterinary Pathology Assistant Professor of Veterinary Anatomy (Collaborator) D V M 1986 Ph D 1990 Iowa State 1992

ADAMS, DANIEL O, Assistant Professor of Aerospace Engineering and Engineering Mechanics B S 1981 Wyoming M S 1983 Ph D 1991 Virginia Polytechnic Institute 1991

ADAMS DONALD R, Professor of Veterinary Anatomy M A 1967 California State (Chico) Ph D 1970 California (Davis) 1974 1985

ADAMS JEAN W Professor of Economics Associate to the President B A 1969 M A 1971 Ph D 1973 Illinois 1972 1985

ADAMS ROY DEAN Professor of Economics B A 1968 M A 1971 Ph D 1972 Illinois 1972 1983

ADAMS SAMUEL KEITH Associate Professor of Industrial and Manufacturing Systems Engineering B Mgt E 1960 Rensselaer M S E 1962 Ph D 1966 Arizona State 1974

AGARWAL SANJEEV Assistant Professor of Marketing B E 1979 Roorkee (India) M S 1980 California (Davis) M A 1986 Ph D 1986 Ohio State 1989

AGNEW, MICHAEL L, Associate Professor of Horticulture B S 1979 M S 1981 Ph D 1984 Kansas State 1984 1990

AGNEW NANCY H Associate Professor of Horticulture B S 1978 M S 1980 Ph D 1984 Kansas State 1985 1991

AHMANN, JOHN STANLEY, Emeritus Professor of Professional Studies in Education Emeritus Professor of Psychology Emeritus Distinguished Professor of Education B A 1943 Trinity B S 1947 M S 1949 Ph D 1951 Iowa State 1975

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